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REFLEX ACTION AS A CAUSE OF DISEASE AND MEANS OF CURE.

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As a preliminary to the paper of this evening upon reflex action as a cause of disease and a method of cure, I must say a word about reflex action itself, and also about another subject with which it is very closely connected, viz. the transference of impressions.

Reflex action is the effect produced by an impression made upon a sensory nerve, transmitted by that nerve to a nerve-centre, and reflected or thrown back along a motor nerve in much the same way as we may imagine the force to be which is applied to one end of a string running over a pulley and transmitted in a different direction by the other end to produce a certain effect. If we fancy the further end of the string to be divided into several strands, each of which is attached to a different object, and which may be, separately or together, affected by a pull on the nearer end of the string, we shall form a still more definite notion of reflex action, for an impression made upon the same sensory nerve may produce various results, according to the strength of the impression

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and the efferent nerve channel along which it is thrown back by the nerve-centre. An impression made upon a sensory nerve, for example, may produce motion of either a voluntary or involuntary muscle, or may affect the nutrition of a tissue. Under the head of involuntary muscles we must class the muscular fibres of the vessels, and those vascular changes which in themselves play a great part in nutrition and secretion may be very greatly influenced by impressions made upon sensory nerves. The way in which we know that the nutrition of a tissue may be influenced reflexly apart from the changes in the vessels is, that observations on the submaxillary gland have demonstrated that we may, under certain conditions, obtain vascular changes without the secretion which usually accompanies them, and that, *vice versâ*, we may obtain secretion without the vascular changes which ordinarily accompany it. Thus, on stimulating the nerves of the tongue, the impression which we make is usually transmitted by the fifth nerve to the brain, and is thence reflected down the chorda tympani to the submaxillary gland. There it induces dilatation of the vessels, and free secretion of saliva from the gland; but if we administer atropia we do away with one of these results, while we leave the other as it was—we completely arrest the secretion, but we allow the vessels to dilate as before. If, on the other hand, we employ physostigma, we contract the vessels, but cause great secretion, such secretion as is usually accompanied by dilated vessels and the free flow of blood through the gland. It is evident, then, that vascular changes, although usually associated with alterations in nutrition, do not necessarily cause them; and that, in the gland we have just mentioned, changes in the tissues composing it will occur without the calibre of the vessels or the flow of blood through them undergoing any material alteration.

We will now say a word about the transference of impressions. Just as we may imagine the further side of the cord passed over the pulley to be divided into different strands, while the nearer side is single, and as we imagine different results obtained by pulling upon the single string by reason of those subdivisions at its further end, so we may have the

nearer end of the cord subdivided into strands, while the further end is single, and thus we can obtain a similar result by pulling any one of the strands on the nearer end. This simile may serve to illustrate the way in which we may obtain a similar result by irritation of various efferent nerves, the stimulation being conveyed to the nerve-centre and reflected down the same efferent nerve in each case. For example, a small grain of sand in the eye will cause a person to wink violently and involuntarily. In this case the impression made upon the sensory nerves of the conjunctiva is transmitted up to the brain, and reflected down the motor nerves of the orbicularis palpebrarum. But some time ago, after the extraction of a tooth, and while the wound in the gum was healing, I observed a twitching of the corresponding eyelid somewhat resembling that which would have been caused by a grain of sand in the eye. Here, also, we have the motor nerves of the orbicularis reflexly excited, but the strand, if we may so term it, through which the stimulus was sent up to the nerve-centre was not the same, for in this case it was a dental, and in the other case an ophthalmic branch of the fifth. With these general remarks on reflex action and transference of impressions, we will now proceed to consider some cases in which reflex action is a cause of disease. I have just mentioned one instance in which intermittent spasm of a voluntary muscle, the orbicularis palpebrarum, was caused by irritation of a sensory nerve. This leads me to remark that a very important condition to be borne in mind is that constant stimulation of a sensory nerve will often produce clonic or intermittent, and not tonic or continuous, contraction of the muscles which it may set in action. It was observed by Nothnagel that if the sciatic nerve of a frog's leg was subjected to constant stimulation under certain conditions, the contractions which it induced reflexly in the other leg were intermittent or spasmodic, but not continuous or tetanic. Another instance in which voluntary muscles are reflexly affected is seen in the acts of coughing and vomiting. Coughing is adapted for the purpose of expelling irritating substances from the respiratory passages, and thus preventing their injuring the organism, just as the act of winking is adapted to remove injurious

substances from the eye. Coughing is usually excited by irritation of the nerves of that part of the body from which the irritant is to be removed. But coughing, like winking, may be reflexly induced by other nerves than those which usually excite it, and thus may prove hurtful instead of useful. Thus, in pleurisy, irritation of the pleura causes the same expulsive efforts as a foreign substance in the bronchi, although those efforts can expel nothing, and only cause pain to the patient; and even when the act of coughing is induced from the ordinary nervous channels, but where the irritant, like tubercle in the lungs, cannot be removed, the act is likewise injurious. In the same way, vomiting is most frequently induced by the presence of irritating substances in the stomach, and proves useful by causing their rejection and thus relieving the stomach of their obnoxious presence. But when the irritation is due to inflammation of the walls of the stomach itself, the expulsive efforts of retching are quite useless, and only exhaust the patient. Here, too, the act of vomiting can be induced by irritation of other nerves than those of the stomach itself. Irritation of the pharyngeal branches of the glossopharyngeal and of the pulmonary branches of the vagus, irritation of the hepatic nerves by the passage of a biliary calculus, irritation of the renal nerves by a calculus resting in the kidney or passing down the urethra, irritation of the intestinal nerves (as, for instance, by incarceration of a hernia), irritation of the uterine nerves by the presence of a fœtus in the womb, or of the ovarian and vesical nerves by inflammation of the ovaries or bladder, may all produce vomiting; and in all, or nearly all, these cases, efforts at emesis will be productive of no beneficial result. When the irritation is further down the intestine, as when an ulcer is situated in the rectum, there is a constant desire to go to stool, but the only results of the expulsive efforts involved in its gratification are exhaustion of the patient and aggravation of the ulcerated condition. In the efforts of micturition, as in those of vomiting and defecation, we have combined movements of voluntary and involuntary muscles. The urine is retained in the bladder by the contraction of the sphincter surrounding its neck, and it is expelled by contraction of the body of the bladder itself with

the assistance of the abdominal muscles. Both the sphincter of the neck of the bladder and the muscular walls of the organ itself may be reflexly excited to contraction, and we may thus have reflex incontinence or reflex retention. One of the most common causes of incontinence of urine, for example, is the presence of ascarides in the rectum; and while the ascarides remain, we may employ drugs to cure the incontinence without success. An interesting case is described by Mr. Teevan in the *Practitioner* for Oct. 1876, where a boy had been treated in vain by medicine, but was at once cured by healing a fistula *in ano* from which he had been suffering, the irritation produced by it appearing to have been the real cause of the incontinence.

We will now pass from reflex changes in the respiratory and intestinal tracts, to reflex changes in the blood-vessels and heart. It is well known that, usually, irritation of a sensory nerve causes dilatation of the vessels in the part supplied by that nerve, and contraction of the vessels in the other parts of the body. This may take place without any alteration whatever in the beats of the heart itself; but if the irritation be very strong, or applied to certain nerves, the heart also may be acted upon. There seem to be certain nerves which act more readily upon the heart than others, and more especially is this power possessed by the fifth nerve, the roots of which are very closely associated with those of the vagus. On stimulation of the branches of the fifth nerve passing to the nose in animals—as, for example, by holding ammonia, strong acetic acid, or chloroform before the nose of a rabbit—the beats of the heart may be suddenly and completely arrested. To a similar arrest of the cardiac pulsations by irritation of the dental branches of the fifth, I attribute the numerous deaths which have occurred through the extraction of teeth under chloroform. It is probable that the extraction of teeth would, under all circumstances, be an exceedingly dangerous operation, were it not that in the waking condition irritation of the dental nerves sets in motion two pieces of mechanism, one of which, to a great extent, counteracts the effects of the other. As I have already mentioned in a former paper, I was once asked how it was that the application of ammonia or acetic acid to the nose of a

fainting person was proved by experience to be beneficial, when theoretically it ought to be injurious by arresting the already enfeebled heart. The answer to this is, that ammonia or acetic acid, held before the nose of a fainting person, by irritating the branches of the fifth nerve, does not act upon the heart alone—it causes contraction of all the vessels of the body, and thus keeps the arterial system full, and the blood-pressure high, despite the diminished current poured into it by the flagging heart. So much is this the case, that I have found in an animal in which the heart was weakened and the vessels dilated by shock, that the application of ammonia or acetic acid to the nose raised the pressure by one-fourth of the whole. In the ordinary waking condition, the sudden stimulus of extracting the tooth has its effect upon the heart completely counteracted by the coincident contraction of the arterioles throughout the body which it also causes. In chloroform narcosis, however, these two reflexes are not influenced equally by the drug, and the reflex upon the heart may remain after the reflex action upon the vessels has been abolished, so that the heart may stop, and death will then ensue, for, the capillaries being no longer contracted, the blood at once drains out of the arteries into the veins, and circulation ceases. Another very important reflex upon the heart is that which is effected through the solar plexus and the sympathetic nerve. A stroke upon the belly will through these nerves stop the heart, dilate the vessels, and induce the most serious conditions of shock, killing the patient, or at any rate bringing him down to death's door. The most important nerves through which the vessels are reflexly contracted are the splanchnics, and the contraction of the abdominal vessels which they supply has much more effect in altering the general pressure of blood throughout the arterial system than the contraction of any other vascular district in the body. But although the abdominal vessels are the chief ones concerned in alterations of blood-pressure, yet local alterations in the various organs may have an even more powerful action upon the nutrition of these organs themselves: for it is probable that although the abdominal vessels may be caused to contract by powerful stimulation of almost any sensory nerve, yet that the blood-vessels in different organs

of the body—such as, for example, the kidneys or mucous membranes—are more affected by irritation of some nerves than of others. The researches of Sanders-Ezn have shown that stimulation of certain sensory nerves, or of limited districts of the skin, will induce definite muscular action due to contraction of limited groups of muscles. It is probable that irritation of limited districts of the skin also induces contraction of limited groups of involuntary muscular fibres or of limited districts of vessels. It is well known that tonsillitis is much more frequently produced by exposure to a draught which strikes the back or side of the head than by a current of air meeting one full in the face, or even by long-continued exposure to a storm in the open air. The cause of this has not yet been satisfactorily ascertained, but it has been attributed with some probability to irritation of the nerves of the ear by the cold current of air. When the throat is irritated, the irritation is not unfrequently felt in the ear; and *vice versâ*, it seems probable that irritation in the ear may cause alterations in the throat. It has been observed that pressure upon the floor of the external auditory meatus in a person who had suffered from otorrhœa produced violent or uncontrollable coughing; and if irritation of the ear thus produces a motor reflex like that of irritation of the larynx, it seems probable that it may also produce a reflex trophic disturbance similar to that which would have followed the direct application of an irritant to the larynx.

Congestion of the kidneys in horses is caused by exposure of the loins to rain, the action of cold upon that district of the general surface having a peculiar effect upon the kidneys, not produced by its application to other parts of the body. It is stated by Sidney Ringer upon Brown-Séquard's authority that blistering the loins will cause contraction of the vessels of the kidney, but I have not been able to verify this quotation. But though there seems to be a peculiar relation between the loins and the kidney, the renal circulation would appear to be affected by other nerves. Thus, for example, in a case narrated by Dr. Griffith at a meeting of the Medical Society of London, albuminuria was produced by the application of a dressing to an anal fistula, which ceased when the dressing was

removed, and again appeared on its re-application. In this case, the vessels of the kidney seem to have been reflexly affected by the irritation applied to the anal nerves to such an extent as to produce albuminuria, although probably no organic disease of the kidneys themselves was present. Exposure of the abdominal walls to rapid changes in temperature may bring on diarrhœa, as the natives of India well know. It is possible that in these instances the cold acts through the abdominal walls upon the intestines themselves; but it seems also highly probable that some part at least of the action is reflex from the surface of the abdomen. Whatever the cause of it may be, however, it may be guarded against by wearing a cummerbund, like the Hindoos; and it is well for persons who are subject to diarrhœa to wear, even in this country, a warm woollen or silken belt around the abdomen.

Irritation in the intestines may induce, not merely vomiting and diarrhœa, but even general convulsions, and cases are on record of epileptic fits having been produced by the presence of a tapeworm in the intestine, which ceased upon the expulsion of the intruder. Hysterical fits, although their pathology is far from being understood, are now becoming to some extent associated with ovarian irritation; for it is found that, in many cases of hysteria, the ovaries are tender upon pressure, and that the hysterical fit may frequently be instantaneously arrested by pressing upon the ovaries.

We have, so far, been dealing chiefly with reflex action as a cause of disease, but now we must say a word or two respecting the transference of impressions. It is well known that persons who have had their legs amputated often complain of cold feet, or of pains in their toes, on change of weather. The irritation here is really in the end of the divided nerve in the stump. But the brain is accustomed to refer all impressions made upon a nerve during its course to the terminal filaments from which impressions usually come, just as we feel a tingling in the fingers when we pull upon or jar the ulnar nerve, or, as it is popularly termed, the funny bone. In disease of the hip, the irritation is felt, not so much in the hip itself, as in the knee.

In headaches one can frequently trace the origin of the pain

to some point at a distance from the aching part. Some years ago I met with a case which was to me very instructive. A woman complained of a headache situated in the left temple. One of her teeth at the same time ached somewhat, and I gave her a pledget of cotton wool, dipped in solid carbolic acid, to put into the cavity. To my disappointment, it had little or no effect; but five minutes afterwards, on the removal of the cotton wool to the cavity of a second tooth, likewise decayed, but which had not at first been suspected as the cause of the mischief, the pain disappeared entirely from the temple. Some time afterwards, I was led to discover an unsuspected decayed spot in one of my own teeth, by a headache in the temporal region. I had noticed that during these headaches there was generally tenderness over the aching part, and that there was also a tender point at some little distance, usually the eye, which was tender to pressure. On this particular occasion, however, there was no tenderness of the eye, and I felt all along the side of the cheek and under the jaw to see if I could discover a second tender spot. Under the ramus of the jaw I found a small gland, painful on pressure. As glandular irritation almost always indicates something wrong in the lymphatics which pass to the gland, I at once suspected something in the mouth to be the cause of the tenderness. As there was no abrasion or tenderness of the mucous membrane of the mouth or tongue, I took a pointed instrument, and tested each tooth successively. At the very back of the crown of the last molar, I detected a small point which was tender upon pressure, and on going to a dentist I was informed that the point was just beginning to decay. Had it not been for the headache, this would have passed unnoticed, as the tooth itself had, up to that period, given me no inconvenience whatever. Headache over the eyes, although frequently depending on gastric irritation, is not unfrequently caused by straining the eyes, and is only to be removed by lessening the work which these useful organs have to perform. One finds this headache over the eyes in men who work much with the microscope, or in women who are engaged in fine needlework. Yesterday I met a case of this sort in the surgery. This was a woman who had been accustomed to work about her house,

but who began to work at dressmaking three months ago; her hours of work being from 9 A.M. to 9 P.M., with an interval of an hour for dinner in the middle of the day. About two months ago she began to suffer from headache above her eyes, which makes her sometimes feel quite giddy. It gets worse in the evening about seven or eight. The headache here, it will be observed, came on about a month after the eyes had been subjected to this unaccustomed strain; and it became worse in the evening after the darkness rendered artificial light necessary, and thus increased the visual strain.

Having said so much on reflex action as a cause of disease, we will now consider it as a method of cure; and the first instance that suggests itself to our minds is the beneficial effect of a blister. Two theories have been proposed to account for the action of a blister. One is, that it dilates the vessels of the skin in the part to which it is applied, and by thus drawing away some of the blood from the inflamed organ below, lessens the pain and inflammation in it. The other theory is, that the blister acts reflexly upon the organ itself. The first of these suppositions is very improbable, because the amount of blood in the skin covered by a blister is exceedingly small, and, moreover, does not come from the inflamed organ, with which the blistered piece of skin may have little or no vascular action. The second theory is much the more probable one, but it is not yet certain how the vessels of the inflamed organ are affected by the blister. We do not know whether they are dilated or contracted. It is most likely, however, that they are contracted, the contraction lessening the pressure of blood upon the inflamed tissues, and thus diminishing the pain in somewhat the same way as we relieve the throbbing in an inflamed finger, by holding the hand above the head, or by compressing the brachial artery. This is rendered probable by the experiments of Zülzer, who found that when a blister was applied to the back of a rabbit for a length of time the skin and the muscles immediately below it were red and congested, but the deeper layers of the muscles, the pleura, and even the lung on the same side, were pale and anæmic. There are few inflammations of the internal organs in which blisters to the surface are not serviceable, but much has yet

to be done to ascertain the exact points at which they ought to be applied in order to produce their maximum effect. Thus, it is said, that in sciatica a blister to the heel will sometimes afford relief, while one applied in the neighbourhood of the nerve itself has little or no effect.

The effect of poultices is probably different from that of blisters, although ultimately productive of similar relief; for if we again take the simple instance of a finger inflamed in consequence of a thorn having run into it, we find that we can relieve the pain in two ways, either by putting the hand into cold water, or by plunging the finger into a warm poultice. Both of these measures, apparently so dissimilar, will produce a like result in regard to the inflamed point; that is, both will lessen the pressure of blood in the vessels where stasis has already taken place. The cold, applied to the whole of the hand, will cause the arteries leading to the finger to contract, and will thus diminish the supply of blood to the inflamed part, and lessen the pressure in the blocked capillaries. The warm poultice will also lessen the pressure, not by diminishing the flow of blood to the part, but by dilating the vessels around the point of stasis, and affording the blood a ready exit into the veins. In the case of internal organs, the blister applied to the skin probably acts like the cold applied to the finger, while the warm poultice placed upon the surface of the thorax or abdomen affects the deeper lying organs in the same way as it does the superficial ones, the warmth penetrating through the thin thoracic or abdominal parietes. On this account, when we wish to relieve pain in the chest or belly, we ought to make our poultices in a particular way. The common practice of mixing the linseed-meal with hot water, and applying it directly to the skin, is quite wrong, because if we do not wish to burn the patient we must wait until a great portion of the heat has been lost. The proper method is to take a flannel bag (the size of the poultice required), to fill this with the linseed poultice as hot as it can possibly be made, and to put between this and the skin a second piece of flannel, so that there shall be at least two thicknesses of flannel between the skin and the poultice itself. Above the poultice should be placed more flannel, or a piece of cotton wool, to prevent it

from getting cold. By this method we are able to apply the linseed-meal boiling hot without burning the patient, and the heat, gradually diffusing through the flannel, affords a grateful sense of relief which cannot be obtained by other means. There are few ways in which such marked relief is given to abdominal pain as by the application of a poultice in this manner.

Besides blisters and poultices, there is a third class of remedies acting reflexly, which is often too much neglected or despised, but is of exceeding service; I mean plasters. In chronic bronchitis, a plaster on the chest affords great relief, the plaster employed being either the simple pitch one, or the *emplastrum calefaciens* of the British Pharmacopœia. The pain in the chest just under the mamma, which is so often associated with anæmia and leucorrhœa, is relieved in the most remarkable way by the application of a belladonna plaster, and the same application also relieves when the pain is dependent on organic disease of the heart. The pain in the back, also, which is associated with leucorrhœa and uterine disturbances, is greatly eased by the application of a pitch plaster, or by a strip of *emplastrum calefaciens* placed along the lower part of the spine. In place of this, the *linimentum sinapis*, put upon a piece of spongio-piline four or five inches broad and ten or twelve inches long, has recently been recommended by Dr. Gamgee. The cause of the pain in the back is not known, but Dr. Gamgee's theory is that it is due to exhaustion of the lumbar portion of the spinal cord, that part from which the nerves for the urinary and genital organs are derived. In order to repair this exhaustion, he thinks that the supply of blood should be diminished, because functional activity is usually associated with rapid circulation, while the opposite condition of partial anæmia occurs during the period of rest and repair. To obtain this partial anæmia, he employs counter-irritation, differing from that of the blister in being less intense and more prolonged.

Such are a few of the more prominent instances of reflex action, as a cause of disease and a means of cure. To enter fully into all of them would occupy more time than the Society can afford, and to explain them satisfactorily would require more knowledge than I either possess or am able to obtain.

NOTES ON THE SYMPTOM-SIGNIFICANCE OF DIFFERENT STATES OF THE PUPIL.

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(*Continued from page* 13.)

In the former part of my paper I have discussed briefly certain general principles in reference to changes of the pupil, and have especially attempted to give precision to the terms which we employ. It will probably be convenient in what I have to say further, if the remarks are arranged under the head of the several different diseases in the course of which it becomes important to examine the state of the iris and ciliary muscle. In doing this I must premise that I by no means aim at an exhaustive *résumé*, but shall content myself by referring only to those subjects which suggest remarks of clinical interest.

Loco-motor Ataxy and allied conditions.

There appears to be a widespread belief that the pupils of loco-motor ataxy are usually small, and in advanced cases very small. From the omission of authors to make any special statements as to the condition of accommodation, we may probably assume that the ciliary muscle usually escapes. The inference from these facts is easy, that the third nerve is not involved, and that it is the vaso-motor which is paralysed, paralytic myosis being the result. Temporary defects of the third, as of other cranial nerves, are well known to be common;

but the symptoms which denote them usually pass away after a time, often after a short time. Thus ptosis, dilated pupil, and cycloplegia, one or all, may be present for a time in the early stage, but only exceptionally persist. On the contrary, the failure of the vaso-motor, as denoted by myosis, rarely disappears, and often tends to slowly increase. Nor is it without its interest to remark that we sometimes encounter symptoms in the viscera which imply vaso-motor paresis. The bowels are often very sluggish, and a torpid state of the bladder (bladder-constipation) is still more frequent and remarkable. There is no defect of the sphincters, and retention of urine to the extent of requiring the catheter rarely happens; but the patient will often find his bladder remarkably tolerant of large quantities, and will confess an inability to commence the act of micturition quickly, and to complete it with energy. This condition of partial cystoplegia may render its possessor quite unable to make water excepting in the erect position. It sometimes alternates with irritability of the bladder. Certain forms of failure of the sexual function, which are so frequently met with in association with iridoplegia and cystoplegia, are also very probably dependent upon disease in the vaso-motor system.

I have not had frequent opportunities for examining the pupils in advanced stages of loco-motor ataxia; but in the earlier periods, and especially in those cases in which the disease is suspected to be due to syphilis, I have seen many examples. Some of the more interesting of these I will briefly relate by way of illustration. It will be seen that smallness of pupil is by no means without exceptions.

A gentleman, aged about 40, has for four years suffered from the characteristic pains of loco-motor ataxy. His gait is unsteady, and he has noticed that in closing his eyes to wash his face he is liable to fall forwards. It is doubtful whether he is syphilitic. He had a sore of very brief duration twelve years ago, but no constitutional symptoms then or since. His pains are, as usual, very much influenced by weather. He has long-standing, hard-edged ulcers in the soles of his feet, suspicious but not certainly syphilitic, the state of which varies with his pains. It is for these that he consulted me. He has

a weak bladder, irritable bowels, and *almost motionless pupils.* His right pupil is absolutely motionless to light, the left moves a little; both are larger than natural (Nos. 8 and 9), the right being the larger. He says that as long as three years ago his wife told him that his right pupil was larger than the other, and this date would fit with the beginning of his ataxic symptoms. He has no appreciable defect of accommodation, and can read No. 1 with either eye.

This case, in which the ataxic symptoms are very definite, seems to prove as regards the iris: 1st, that the paralysis may be very slowly progressive; 2nd, may be attended by slight dilatation instead of contraction; and 3rd, may occur in one eye before the other. It is by no means improbable that the changes producing the iridoplegia are in the lenticular ganglion, and that the escape of the ciliary muscle may prove to be only a question of time.

In the following case the conditions are somewhat different, but we have the same fact of a large pupil, with symptoms of ataxia. A boiler-maker, aged fifty-two, who has eight children, and who denies syphilis, has been ailing for a year or more. His right eye has been injured, and we cannot examine with accuracy the state of its iris; but in the left there is cycloplegia, with mydriasis. The left pupil, as large as No. 9, contracts a little on exposure; accommodation is wholly lost, but with a suitable glass he reads the smallest print. None of the other branches of the third nerve are implicated, and we may conjecture (with some hesitation) that the ciliary ganglion is the seat of the disease, its vaso-motor elements having as yet escaped. The man, although looking well, complains much of the numbness of his hands, and of pains in his head and legs. He suffers much from cramp, and sleeps very badly. He can walk fairly well, but feels giddy with his eyes shut. His bladder is weak but often irritable, and his feet, usually hot, are liable occasionally "to go as cold as a snowball." He assured me that his sexual functions were perfect, but his wife said that they were almost in abeyance. His symptoms dated pretty nearly from his second marriage three years ago. He had not been intemperate, but had smoked heavily.

If a rather small pupil is quite motionless on sudden exposure to bright light, but contracts a little when the patient is made to accommodate or to converge the eyes, I think it may be assumed that the vaso-motor filaments to the dilator are paralysed, and that the third is probably intact. I have such a case now under observation, and the man has in addition to his fixed pupils total paralysis of the right sixth nerve, and almost total deafness in the right ear. He had syphilis many years ago. He has no other indications of defect of the vaso-motor. His pupils are about No. 3—that is, not very small. In such cases there is usually further evidence that the third nerve is not paralysed, and that the disease is not in the ciliary ganglion, in the fact that the function of accommodation is retained. We may note three stages in the completeness of iridoplegia: 1st, inability to respond to the influence of light; 2nd, inability to act during convergence of the eyes; 3rd, inability to act under stimulation by atropine and Calabar bean. These stages are probably usually developed *seriatim*. The first is common in cases in which the second and third are yet absent, and the first and second may be present without the third. Inability to respond to direct stimulation by drugs is very rare indeed, and probably occurs only when all the peripheral ganglion structures (lenticular ganglion and choroidal ganglionic cells) are destroyed.

It would seem highly probable that these peripheral structures are capable, to some extent, of originating tension or force, and that they may sustain the functional activity of the iris and ciliary muscle in cases in which the sources of central supply have been much damaged. This is probably possible in a greater degree in the case of the ciliary muscle than in that of the iris. If the third nerve be absolutely destroyed, then paralysis of the circular fibres and of the ciliary muscle must result. If, however, in place of absolute destruction, the nerve be only enfeebled by disease in its nucleus, then it seems possible that whilst the recti fail to a very considerable extent, the iris and ciliary muscle may remain fairly vigorous. Such was the condition of things in a man (Burton) who was the subject of symmetrical ophthalmoplegia externa, and could only to the very slightest extent use

any of his recti. He could accommodate well, and his pupil acted, not perhaps quite normally, but still very fairly. It is to be noted that at the time of this observation the levators of his upper lids had almost wholly recovered. At a former period complete ptosis had been present, but I believe he had never lost accommodation.

Another man under observation at the same time had lost symmetrically the superior and inferior recti, and had imperfect ptosis, but retained perfect power of accommodation, whilst his pupils, motionless to light, acted only in concert with the internal recti.

A very rare condition, in which the final stage of absolute iridoplegia under all forms of stimulation was nearly attained, presented itself in the person of an elderly clergyman. This gentleman had been under treatment for some years for myosis, and had been enabled to read much more easily by the continuous use (for four years) of weak solutions of atropine. He was myopic, and thus had felt the inconvenience of cycloplegia less than would otherwise have been the case. In spite of his myopia, however, he constantly used + 16 for reading. By atropine every night he had kept his pupils at No. 2 and No. 3 respectively, the left being the larger, and both quite motionless. By using a 4-grain solution every three hours for one day, we dilated them to No. 3 and No. 4 respectively, but not further. The left (the larger one) was oval. Now this patient's history was very interesting. Thirty years ago he had been under much treatment (Mr. Guthrie and others) for widely-dilated pupil on the left side. After resisting treatment for long, the mydriasis gave way to myosis, and both pupils contracted until very small. For this condition atropine became necessary. There were no indications of loco-motor ataxy, and Mr. M. seemed in good health. He had, however, a few years ago experienced a fit of depression, which obliged him to leave business, and he has for many years had muscular twitchings in the face. Some years before his mydriasis he had syphilis. Both his eyelids drooped at the time I saw him so as to almost cover the pupils, but he did not complain of this, and he did not remember to have ever suffered from squint, double vision, or ptosis. We may conjecture that in him the ciliary

ganglion is destroyed, and the ganglionic cells in the choroid implicated.

The following case is one of the most important in reference to the clinical meaning of myosis which has ever come under my observation, and I must trespass on the reader's patience with rather full details as to the conditions which accompany the iris symptoms. The case is probably one of ataxia from syphilis, but the facts would suggest rather strongly that the vaso-motor system of nerves is the part chiefly affected. The man has extreme myosis ("pin-head"[1] pupils), which has slowly advanced, and with it he has indications of general derangement of circulation-force, loss of power in the bladder, and liability to attacks of temporary paraplegia. That the paraplegia is not due to spinal disorganisation is rendered certain by the circumstance that it passes off almost completely, and even within so short a time as a few days. Extreme susceptibility to the influence of cold, and benefit from the use of warmth, are very prominent features in the case. With regard to the significance of the pupils, let me especially note that they do not imply disease of the ganglion —since accommodation is perfect, and the circular fibres active,—but rather disorganisation of the vaso-motor filaments alone.

A man named H——, aged 44, was kindly sent to me by Dr. Hughlings-Jackson that I might examine his pupils. He was under the care of Dr. Milner Fothergill, by whom he had been referred to Dr. Jackson, and whose permission I have to publish the following notes. The chief facts of his case were the following:—In early life he masturbated, and his sexual functions have never since been very vigorous; and he has, as he considers, always been very nervous in connection with that cause. In 1862, when he was twenty-nine years of age, he contracted syphilis. His eruption lasted a long time, and was finally cured at Blackfriars by Mr. Startin. He believes that he took the iodide at this time for nearly a year. Soon after his cure he had joint pains, which were called "gonorrhœal rheumatism," and from that time to the present he has never been long free

[1] In my scale (see page 4), No. 0 is "pin-hole" (rather large), and No. 1 is "pin-head."

from pain in one or other part. The kind of pain from which he has suffered has, as I will tell you presently, varied a good deal. Of late years his pains have got worse; he has been weaker, and, what is very important, he has had two temporary attacks of paraplegia. Finally, his pupils have contracted until the right is little more than a pin-hole, and the left only about twice as large. It will be seen that I have suggested two possible causes for the progressive failure of nervous functions from which this man suffers. It may be a consequence of sexual atony such as follows from premature and excessive excitement of the functions, or it may be from syphilis. I have now to allude to a third possible influence, and to state that he has smoked heavily and drank spirits freely. In spite of all these influences, he is a healthy-looking man, though rather pale.

The affection of the nervous system is in one sense universal, but it falls with especial stress on certain parts. Every kind of exertion fatigues the organ employed. If he walks far his legs ache, if he speaks long or reads aloud his voice fails, and if he looks much at anything his eyes become painful and tired. No part of his body is comfortable: his skin feels tight, or tingles, or smarts, or is numb at different times; his head always aches more or less, and he has especially severe aching pains in his jaws, his nose, the lower part of his abdomen and his ankles. His pains are for the most part "aching" or "rheumatic" in character, and attended by a feeling of tightness, but sometimes he has sharp stabbing pains. He especially describes what he calls "a shuddering pain." These shuddering pains occur in various parts and last only a minute or so, and creep over a considerable area, often in the lower part of the abdominal wall, and often in front of the ankles. His legs frequently become numb when in bed, and he is at all times very sensitive to cold. The soles of his feet often ache or feel very sore, but he does not complain of their being numb, or of feeling as if treading on wool or cork. He can stand pretty well with his eyes closed, and can walk fairly. His right eye is almost perfect, and he slowly reads No. 1 with either, but as I have said he complains that the eyes soon tire.

Some few months ago he felt his legs very numb, then they

gradually became weak, and finally he could not use them at all. He lay in bed at his lodgings several days quite unable to get out of bed. He had no one to attend to him excepting a woman, and as he could not manage to empty his bladder excepting in the erect position, he was obliged to allow his urine to accumulate, and when he was finally carried into St. Thomas's Hospital his bladder was very much distended. This retention had not caused him any great distress. At the hospital a catheter was used, and he believes that "several quarts were drawn off." Thus it will be noticed that we have reason to believe that his bladder is in a state of atony, unable to relieve itself excepting under advantageous hydrostatic conditions.

After he had been in St. Thomas's a few days his legs began to recover, and at the end of twelve days he walked out of the ward. He now went to the Walton Convalescent Home, and there he had a relapse and partially lost the use of his lower extremities again, but not of his bladder. He recovered again, and can now walk a mile or two at a time. On neither occasion did he lose sensation in the skin of his legs, but a feeling of numbness preceded the loss of motor power. As regards treatment, he thinks that he was benefited by the warm bath as much as anything, and believes that he did not on either occasion take the iodide. Several of his medical advisers have at different times questioned him as to his syphilis, and suggested that his symptoms might be due to a taint, but he believes that he has not had the iodide prescribed for many years. A homœopathic told him that his symptoms were probably due to the large quantity of iodide which he took in the first instance. I may add to what I have said that the man shows no local defects either in sensation or motor power. His calves are tolerably large and measure each fourteen inches. His limbs are especially stiff and weak on rising in the morning, and similar results in this respect follow both over-fatigue and sleep. As a rule he sleeps badly and never wakes without a headache. He has never had any drooping of the eyelids or paralysis of the muscles of the eyeball.

Although some of the symptoms commonly met with in loco-motor ataxy are absent, yet I have no doubt that this case belongs to that category. It is true the man can walk with

his eyes shut, and he has not in any conspicuous degree the ataxic gait, but he has the small pupils, the stabbing pains, the attacks of temporary paralysis, and there is the slowly progressive advance of symptoms.

In connection with this case the following is of very considerable interest, since it presents some very similar points, with, however, important differences. It is an example of incomplete ophthalmoplegia interna, and with cystoplegia (partial), and some symptoms of loco-motor ataxy—the whole being possibly due to syphilis.

Alfred D., a fireman, aged 34, married six years, and the father of two children, came to Moorfields on account of failure of sight. His pupils were motionless to light, right No. 6, left No. 2. Both of them contracted on convergence, and in equal degrees. The left had, he said, failed a week ago and had remained the same since; the right had failed still more recently. It is very probable, however, that these dates were not accurate; at any rate they referred alone to failure of the ciliary muscle, the only part of his condition which gave him inconvenience. With + glasses he could see perfectly.

He was a pale man, and had, he said, of late suffered much from leg-weariness. If he walked a short distance he became so tired that he felt as if he could not possibly move his legs any longer, and under these conditions his legs would ache very much. At one time—six months ago—his sexual vigour and desire had both greatly diminished, but recently they had returned. He had of late frequently required the catheter on account of inability to pass water. I examined with a full-sized instrument and found no stricture. There was a history of incomplete syphilis nine years ago. He did not recollect any secondary symptoms.

His vision with R. was $\frac{2}{2}\frac{0}{0}$ and 8 J. near point 13″.
„ „ „ L. „ $\frac{2}{3}\frac{0}{0}$ and 16 J. „ „ 18″.

In each eye perfect sight for near objects was obtained by a suitable convex glass. It will be seen that the cycloplegia was not complete in either, and was greater in the left than right, yet the left had the smaller pupil.

The next cure which I shall narrate is one of third-nerve

paralysis on left side only, with partial recovery under treatment, but with ophthalmoplegia interna (almost complete) remaining. There was a remote history of syphilis.

Samuel B——, aged 39, was Mr. Tay's patient at Moorfields, February 1878. He had complete syphilis twenty years ago. He married five years later, and has now three children, all healthy; none have died.

Five years ago he had swelling of one testicle, which lasted a long time, and for which incision was advised. It ended, after abscess, in shrinking of the gland, with induration. Probably at this period he took specifics for long.

His eye symptoms began last August, and in the end of that month he was admitted under Mr. Tay's care with double vision. No exact notes were taken, but his left pupil was large, motionless, and "he could not see a letter." The diagnosis then written was "paralysis of left third nerve." His lid drooped, and all the third-nerve recti were affected. On January 17 the left pupil was small and motionless (paralysis of vaso-motor). He could see $\frac{20}{100}$, and with + 20 $\frac{20}{20}$, and with + 7 read 1 Jäger (hypermetropia and cycloplegia). The pupil was almost motionless, but could be made to act a little on focal illumination. This was after three months' treatment, with 5-grain doses of iodide of potassium. Before the treatment he had suffered a good deal from headache, and pain at back of eyes. The recti muscles and the levator palpebræ had now recovered, and he had no double vision, excepting now and then in looking upwards. Improvement began a month after commencing the iodide. He is liable to some rheumatic pain, but has no stabbing pain.

He does not consider that his right eye has ever ailed anything.

On February 26 I examined him carefully. In full light his pupils are equal, and of normal size (No. 3 to 4). The left, when shaded, dilates only to the slightest possible extent and does not act in the least when the other eye is excited. The right pupil acts well, and in moderate light is nearly twice as large as the other.

With R. he reads 1, and with L. 14, or by effort 10, or with + 7, 1. Ophthalmoplegia interna (almost complete) seems to

have been left after paralysis of third. It is probable that the third-nerve elements in the ganglion have to some extent recovered, since he has no longer a dilated pupil, and there is some slight action on stimulation by light.

It was very interesting in this man to observe how, when the left pupil (paralysed) was exposed, and the right in a full light was alternately covered and exposed, the left remained quite motionless, and this, although the retina in both eyes was perfect. It thus became very obvious that the break of communication was in the irido-motor nerves. The converse of this is seen when, with one eye totally blind, the nervous apparatus referred to remains perfect. In these, as is well known, the pupil of the blind eye acts vigorously in connection with the retina of the other as an incident-excitor. As I have elsewhere stated, I have found it exceedingly difficult, in cases of iridoplegia with syphilitic history, to produce any improvement under specific treatment, whilst, as is well known, the cases of paralysis of the external ocular muscles almost always recover quickly. This case exemplifies this point, for the patient under the iodide got quite rid of his ptosis and strabismus, whilst his iris remained motionless as before. I wish also to draw attention to the fact that, although ophthalmoplegia interna, when uncomplicated by other paralysis, is usually symmetrical, yet that, when associated with third-nerve paralysis, it is often not so. I may add in anticipation that, when third-nerve paralysis is symmetrical, it is not usually accompanied by ophthalmoplegia interna. These statements require the confirmation of further experience, but they are very suggestive and well worth keeping in mind.

I have recently had an opportunity of testing the state of the pupil in a case in which the eye was totally blind after rupture of the optic nerve. A railway porter had a thin ash-stick thrust violently into the nasal side of his left orbit, and never had any perception of light afterwards. There was a large wound, and the eyeball was everted. A month later the optic disc was pale, and perhaps a little hazy, the pupil being quite motionless on exposure. Five months later I examined the activity of the pupil carefully. There was not the slightest action when, whilst the other was covered, it was

exposed to light. When both were open, it maintained nearly the same size as the other, and acted with it most readily. So far as I could tell, it maintained under all conditions the same size as the other. If the other was covered and he were told to converge, or to imagine himself looking at a near object, it contracted at once. The efficiency of the one retina in constituting an incident-excitor path for the stimulation of the internal motor apparatus of its fellow was most conclusively shown.

The following case illustrates what I have said above as to the more symmetrical development of ophthalmoplegia interna in association with paralysis of the trunk of the third nerve. It differs from what is more usual in that there was no history of syphilis, but the negative in this respect must not be considered as certain. It is possible that the eye symptoms are premonitory of ataxia.

Mrs. T., a widow aged 50, is the subject of paralysis of the right third nerve, and with it of the vaso-motor filaments to the iris also. Thus the pupil, instead of being dilated, as it should be with defect of the third, is of natural size, but quite motionless. We will investigate her case in reference to the probable cause. She entirely denied all history of syphilis, and said that her husband was steady, and that her children are healthy. She added that she had always feared that she should have paralysis, as her father died of it (æt. 67), and also two of his brothers. Her earliest symptom was aching in the bones of her legs after exertion. This was about two years ago. She was obliged to give up charing-work because she could not go upstairs from the weakness and pain in her legs. Next she had twitchings in the right leg or thigh, and subsequently occasional numbness and tingling in her hands. She complained much of joint-aches in the hands, and mentions twitchings in the muscles of the upper arms. These twitchings are not painful. About a year ago she began to experience attacks which lasted a few seconds, during which she thought she should lose her senses. She never fell or became unconscious, and usually the feeling would after a while pass completely off. About three months ago she began to find that her right eyelid drooped, especially after sleep, and that she

saw double. This was especially the case if she rose in the night.

Two months ago she had very severe pain in right side of head, so that she could not sleep. This has left her. She walks fairly. Sleeps too heavily.

I cannot state anything as regards the results of treatment.

(*To be concluded.*)

ON A PROLONGED FIRST STAGE OF TABES DORSALIS: AMAUROSIS, LIGHTNING PAINS, RECURRENT HERPES; NO ATAXIA; ABSENCE OF PATELLAR TENDON REFLEX.

BY THOMAS BUZZARD, M.D.,

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In a paper published last January ('Berlin. Klin. Wochensch.') Professor C. Westphal has again drawn attention to a symptom of tabes dorsalis, which he has now had the opportunity of observing in a large number of cases, and which may be described as follows:—In health, if a man sits with one leg crossed upon the other, and the ligamentum patellæ be then smartly struck just below the knee cap, there occurs a contraction of the extensor muscles in front of the thigh, and there is consequently a sudden kick upwards of the leg. Dr. Westphal pointed out in 1875 that this, which he calls by the somewhat awkward title of the "knee-" or "leg-phenomenon," was absent in typical cases of tabes dorsalis. In his late communication he gives reasons for thinking that the test may prove very useful in the early stage of tabes, before there is any ataxia. He says that he has seen cases of pains without ataxia or sensory troubles, but with coincidently commencing optic atrophy, and absence of "knee-phenomenon." One very striking example is related. A woman, thirty-six years of age, suffered from pains, "like knives," especially in the left lower extremity, frequent and severe. She had also hyperalgesia of the skin, so that the least contact was painful. Pains came much more rarely in the right leg, and were not to be compared in severity with those in the left. Repeated ex-

amination showed that the knee-phenomenon was absolutely wanting in the left leg, whilst it was present, but not strongly marked, in the right. The patient's gait was not ataxic. No sensory troubles of the left leg appeared objectively, nor was there loss of muscular sense, as tested by closing the eyes. In spite of all this the case was certainly one of tabes, for there was, besides the pains, white atrophy of the optic nerves, inequality of pupils, along with very frequent and scanty urination.

In all the cases of confirmed tabes in which I have used this test since I became acquainted with Dr. Westphal's suggestion, I have found, as he has done, that the knee-phenomenon was absent. The case which I proceed to relate is one which goes to confirm the diagnostic value of the symptom described. It is one of the nature of which there can, I think, be no question; and it is published, not only on account of the support which it lends to Dr. Westphal's valuable suggestion, but also from the extreme interest which attaches to some of its other symptoms. Amongst these are the great prolongation (already, if we include the two years of herpes unaccompanied by pains, seventeen years) of the first stage of tabes—the remarkable recurrence of herpes every few weeks during fourteen years, as well as certain points connected with the slight amount of vision which still remains in the amaurotic eyes.

It was in April 1864, just fourteen years ago, that I first examined A. B., who was then 36 years of age. His complaint was of bad nights, and troubles in his organs of digestion. Incidentally he mentioned to me the state of his sight, which had become greatly impaired. With the right eye he could only discern light from darkness; with his left he could recognise faces, but all outlines were blurred and confused. He had consulted several ophthalmologists on account of his eyes, and they had described his disease, he told me, as atrophy of the optic nerves. For this he had undergone a variety of treatment, including hypodermic injection of strychnia and the application of the constant current, without any effect.

Family history.—His father, who was gouty, died at 61 years of age. His mother, who was then still living, had always

enjoyed excellent health. (She has since died, at 84 years of age.) No history of tubercle or neurosis in the family.

Previous history.—In infancy, so he had been told, he suffered from "inflammation of the bowels" and bronchitis, besides an attack of whooping-cough. All his life he had been subject to take cold easily, and to suffer from bronchial attacks; and there had always been from his childhood a tendency to looseness of the bowels. When twelve years old he had measles badly, from which he recovered after a long illness. After this, for twenty years he enjoyed excellent health. His habits were temperate in all respects; and the mode of his life, a great part of which was spent in the open air, conduced to healthfulness. He had never had syphilis, but had once or twice suffered from gonorrhœa.

In the year 1860 he had an attack of "muscular rheumatism," which lasted about a fortnight, but only kept him in bed a day or two. There was no fever; his joints did not swell; and he was able to do his work except on one or two days. As the pains in his limbs ceased, the attack was immediately followed by jaundice, from which he suffered for three weeks, and during which he lost two stone in weight. He is quite clear that since this attack he has never been "the same man." He never got up his health or strength again. A very notable sequela had been insomnia. He would retire to bed between eleven and twelve o'clock, lie anxiously restless till three or four, and then drop off to sleep for four or five hours. Sometimes, on the other hand, he would sleep on first going to bed, but in that case would wake at three or four o'clock, and sleep no more. Altogether, he had rarely more than four or five hours' sleep at night.

In 1861 he had for the first time an attack of herpes. It was after undergoing great fatigue that he noticed what he took to be a boil on his right buttock, but which really consisted of a crop of vesicles, which burst and formed scabs. During the next two years he had, on four or five occasions, a recurrence of the eruptions in the same situation. There was rarely more than a single group. These attacks were not accompanied by any pain, beyond a little burning at the site of the vesicles. The eruption did not always follow the same

course. There would be a group which appeared to be going on to maturity, when it suddenly became, as he describes it, stagnant and abortive. The vesicles would not burst, but would wither up and disappear in a few days, without any scab being formed. At another time, after apparently aborting, or at least taking no action for twelve or twenty-four hours, they would then, as it were, re-develop and go through the ordinary course.

It was not till 1863, two years after the attacks of herpes had commenced, that they began to be associated with pains. These were at first confined to the right lower extremity; and attacks had been since occurring, when I saw him, at intervals of a month or so. Their character will be particularly described later on.

The account which he gave of the onset of his ocular disturbance is curious. It seemed that in October 1862, after a severe attack of diarrhœa, he suddenly found an imperfection of sight in his right eye. In reading he observed that he failed to see the end of the word at which he was looking; next he found that whilst reading the top line of a page he could not see the second or third line without lowering the eye, so that ere long he had to put his finger on a line, dropping it as he read, and so spell out the words and lines. This condition, as regards his right eye, stretched over a year. In the autumn following he took a holiday, and amused himself by sketching from nature. He found it necessary to paint by the aid of his left eye, shutting out the right by means of a piece of cardboard suspended from his hat. His health, though then improved, was not up to the old standard, sleep being uncertain and digestion imperfect.

In October 1863, exactly one year (almost to a day) after the failure of the right eye, similar symptoms attacked the left. He had been out sketching, the sight of the left eye being perfect, and went home and dined. In the night he was attacked with diarrhœa, which recurred in the morning. Next day he found that he could not see the ends of words with his left eye, and, as with the right eye, so the sight of the left gradually deteriorated, and was diminishing at the time when he first came to me.

Examination showed the heart, lungs, and liver to present no sign of disease. The urine, which was slightly acid, deposited much urate of ammonia; it contained neither albumen nor sugar, and showed no excess of phosphates.

A. B. remained under my observation at this period (1864) for three or four months. During this time the symptom of which, next to the insomnia, he most complained was the very frequent occurrence of nocturnal emissions. These would happen sometimes four or five nights together, recurring after an interval of a few nights, and repeated altogether from ten to fifteen times in a month. He had always since puberty been troubled a good deal in this respect, but the discomfort had rather increased than diminished. The discharges were involuntary, and were not followed by any feeling of exhaustion.

Meantime the pains which had begun in 1863 continued to recur at short intervals. In 1867 my attention was particularly directed (as I find by my notes) to the pains, and also to the herpetic symptoms from which he suffered, and which he informed me were a repetition of what had occurred on various occasions during the preceding six years. One such attack occurred in December. He woke up in the night with terrible pain in the right sciatic nerve, which he described as "knife-like spasm." It persisted, occurring at intervals of a few minutes only, all the following day. This kind of pain, he said, had been liable to attack one or other of his lower extremities—and especially the right—in the thigh, knee, leg, or ankle. It would generally last a week, and was always associated more or less with an eruption of herpes. The pain usually came simultaneously with, or preceded, the herpes by a few hours, but on the other hand it sometimes, although less frequently, followed the appearance of the eruption. The pain might be in various parts; the herpes *always came in one place*. It always occupied the upper part of the right buttock. Even when, *e.g.*, the pain attacked the *left* lower extremity, the herpes came in the right buttock. He calculated that during the preceding four years he must have had at least fifty or sixty of such attacks of herpes. A "good healthy crop," as he described it, would take from ten to fourteen days ere it

subsided. The pains generally continued throughout, and ceased about the time that the scabs were scaling off. On a very rough average he would have such attacks once in four or six weeks. It appeared that between twenty-four and thirty years of age he used to be affected very frequently indeed with herpes præputialis, which occupied sometimes the prepuce, at others the base of the penis and scrotum.

For fifteen years this patient has suffered every few weeks (with a certain exception) from attacks of pains which he describes as "forked lightning." The seizures were closer together and more violent in character from the end of 1872 to the middle of 1874. During this period of about eighteen months he would have a bad recurrence every two or three weeks.

I have notes of one such attack which I may transcribe.

"1873, *Feb.* 14.—Pains which were formerly rare come now very frequently, and with tremendous force. The stomach seems, to him, to be the directly exciting cause. The pains always affect now the left leg; formerly the right was alone subject. He shows a point two or three inches above the left knee, which has been an especially frequent seat of pain. Over a space not bigger than a crown-piece it is as though some one was giving him repeated violent digs with a knife. The present bout came on yesterday at 5 P.M., and has never ceased for more than two minutes at a time. He knows from experience (and the event proved that he was right) that this bout will go on for four or five days, gradually getting less and less acute, and with longer intervals, until he ceases to suffer. And he will be pretty sure to have herpes. Sometimes the herpes appears first. He will have a patch of heat and itching on the buttock, and then he gets a "fine crop" of herpes. Sometimes the vesicles are abortive, and do not come to the breaking stage. Then the pain does not come so rapidly. The herpes is always confined to the *right* gluteal region, and never passes to the left of the spinal column. I can see now some scars of recent attacks . . . .

"The part where the pain first begins, always remains as it were the camp or head-quarters of it—pains radiating from it

as a sort of focus. So to-day he has had occasionally pains in the left shin and calf, but the left heel, where the pain commenced, has continued to be its principal seat."

From the middle of 1874 till August 1876, he enjoyed almost complete immunity from these attacks. There would be, it is true, at rare intervals a little herpes, accompanied by a faint reminder of his pains, which he graphically describes as "sheet lightning," in comparison with their ordinary forked-lightning character.

Present State.—As regards the relation of herpes to pain, he says that perhaps once in six times the eruption would occur without any pain whatever, or, at the most, with a very little "sheet lightning." Very rarely indeed has he had pains without any herpes, although the eruption has been sometimes so insignificant that it would have escaped notice but for his long experience of it. As a rule, there would only be one crop of herpes, but occasionally a second crop would appear near to the first. In the years of only moderate severity the intervals of attacks of pain would be from six weeks to two months or so. Since they recurred severely in August 1876, they have continued to trouble him at about this rate.

I have lately (June 10) taken the opportunity of examining carefully an eruption of the kind. About two inches above, and to the left of the sulcus between the nates, very near therefore to the sacro-iliac synchondrosis of the left side, I found a single group of seven or eight vesicles of about the size of a large pin's head—some larger, some smaller. They were collected (almost all touching each other) upon a base the size of a threepenny piece, the skin of which was slightly pink in colour, and when pinched up felt hard, as compared with the adjacent integument. The vesicles contained transparent and colourless fluid. This group had appeared two days previously. At the same time I observed one or two brown scabs (the remains of vesicles) on the upper and inner part of the left thigh, where the scrotum rests upon it. On the following day the base was less hard, and paler in colour, the vesicles flattened and shrivelling.

It is only since 1873 that herpes has appeared to the left of the spine. Before that time it always came upon the right

buttock. Since then, however, it has been, if anything, a little more frequent on the left buttock than on the right, and most frequent of all, perhaps, about the middle of the sacrum and the sulcus of the nates. Herpes has never shown itself on both sides at once.

It is to be noted that his pains do not appear, at least commonly, to originate in the buttocks, which, however, are the constant seat of the herpetic eruption. Occasionally, it is true, the pain will seize him in either groin, and then shoot round over the hip to the buttock; but these are much less frequent sites of pain than others. He cannot say which is the most frequent site.

The patient has a firm conviction that all his attacks of pain and herpes are associated more or less with intestinal disturbance. If he feels that he has eaten too much at dinner, he is apprehensive of an attack, and is pretty sure to have a "quiver," or flash or two of "sheet lightning." Then if there be, as is sometimes the case, a violent discharge of flatus downwards, he knows he is safe. But if this does not happen, the expected attack comes on. Even if a bad attack of pain has started, should there be an escape of flatulence he will often get relieved of pain in ten minutes. During bad attacks there are constant recurrences of a pressing desire to pass flatus by the bowel, but the passage does not take place. He does not associate the attacks with the use of any particular kind of food, nor does weather seem to influence them.

Fatigue appears to induce attacks, and, as he thinks, in the following manner. Overtired, he sits down without appetite, which comes, however, as he eats, and then, perhaps, he exceeds a little in the quantity of food taken. Under these circumstances an attack is pretty sure to follow. If, however, he is hungry, and after eating a moderate meal is quiet for two or three hours, he either escapes altogether or there may possibly be a flash of "sheet lightning," which does not go on to the "forked" variety. The last attack began in the night, after taking a small glass of stout at bedtime. At times, when his pains are very bad, there is a

sense of weight in the lower bowel, and a feeling as though something wanted to come away and could not.

Vision: Right eye.—At the present time he can see two window-lights as two, but there is no evidence of sashes. Very thick black hands on a white-faced watch are quite indistinguishable.

Left eye.—He can see the angle formed by the black hands of his watch, and thus get an approximation to the hour. He cannot in the slightest degree recognise any one by sight, nor can he walk about without a companion to lead him.

There is a point of interest as regards colour. The colour blue, he tells me, is not seen as such by him, but as bright light. A piece of bright blue ribbon looks like a bit of burning magnesium wire. If he is walking under a bright sun upon yellow gravel, the shadow which he casts (and which under such conditions is of course very blue in tone) is actually felt by him as something lighter than the sunlit gravel upon which he treads. And so also the shadows of trees, at a little distance, came out quite light from, as he supposes, the influence of the blue in their composition. In photography, he reminds me, the colour blue comes out white.

The sight of his eyes has continually, but very slowly, deteriorated since they were first affected. The pupils are of moderate size, and equal. There is no manifest affection of the external muscles of the eyes.

Direct Ophthalmoscopic examination. Right eye.—The optic disc presents a marked change in colour and character. Instead of the normal warm white or pinkish tint with fine striation, it is of a cold, slightly bluish-grey tone, which suggests the idea of its being painted in opaque oil colour. Its surface is flat, dense, and uniform, no signs of any central depression or *lamina cribrosa* being perceptible, and the sclerotic ring appears to be merged into the disc, the outline of which comes out sharpagainst the rich red of the choroid. There is no marked diminution in the size of the retinal vessels, but they appear as though applied to the disc, and subdividing near its upper and lower border leave the large bulk of the disc free from any trace of a blood-vessel. Both the branches of the artery and the veins are

bordered by a distinct white line on each side for a distance of nearly two disc-lengths from the optic papilla. This white line would measure about one-third of the diameter of the vessel.

Left eye.—The appearances are practically the same, except that there are a few more minute vessels on the disc than are to be found in the right eye.

Organs of locomotion.—A. B. walks without the slightest tendency to stagger, and this even if (as he will sometimes attempt upon a quiet and straight country road) he dispenses with the arm of a companion. His gait is somewhat peculiar, as he rises high upon his toes at each step; but I have no reason to suppose that this "equine action," as it might be called, perhaps, is not natural to him. His walking power is a good deal diminished; he cannot now manage three or four miles at a stretch without distress.

Tendon reflex.—If he sits with his legs crossed, and the ligamentum patellæ be smartly struck, there is no contraction of the quadriceps extensor muscle, consequently the leg is not jerked up. If the foot be suddenly and forcibly brought into a state of dorsal flexion, and the tendo Achillis struck, there are no rhythmic movements of the foot. This applies to both lower extremities.

Cutaneous sensibility is absolutely normal in all respects throughout his body. Nor is there any affection of the muscular sense. He knows exactly where his legs are, and can direct his feet readily. So also he can make his two forefingers touch at their points with as great precision as any one in health.

Pains in the trunk.—Within the last twelvemonth he had on three occasions experienced what he calls "sheet lightning pains," inclined now and then to develop into a passing "forked lightning," in the right side of his chest. A week ago he suffered for twelve hours, at intervals of only two or three minutes, from attacks of forked lightning pains, which invaded the right side of the chest from about the second to the sixth rib, and appeared to go through to the scapula, corresponding apparently with the intercostal nerves. They were not accompanied by any herpes.

General condition.—A. B. is of healthy aspect and fair complexion, his brown hair being but slightly tinged with grey. His disposition is of the happy kind which is, curiously enough, found so often in patients suffering from tabes. There is marked arcus senilis in each eye. His arteries show no signs of thickening. Bladder normal. Bowels regular, and less disposed to diarrhœa than formerly. Tongue clean. He does not suffer from any constrictive feeling in the waist. His digestion has improved, and he has increased in weight during the last four years.

Examination shows the nates fleshy and firm, the skin covering them, and the sacral region generally evincing no sign of anæsthesia. There are a few slight scars of recent attacks of herpes. One may see, perhaps, traces of three or four, but all except the most recent are very faint, and in strong contrast with the marked cicatrix which follows an eruption of ordinary shingles. Of the attacks which took place at periods antecedent to a few months ago, not a vestige remains.

The character of the optic atrophy, and of the pains, leaves the diagnosis of the nature of this case in no doubt. It is evidently one of sclerosis of the posterior columns, although that particular symptom which has caused the name of progressive locomotor ataxia to be given to this class of disorder is as yet absent. On the other hand, it is interesting to note that the test which we owe to Westphal—the absence of reflex contraction of the quadriceps extensor muscle on striking the ligamentum patellæ—here also lends support, if such were needed, to the diagnosis of tabes dorsalis.

The absence of inco-ordination of movement, whilst other symptoms of the disease—notably the flying pains—are well marked, is, I need scarcely say, not at all uncommon in the first stage of tabes; but it is exceedingly rare, so far as I am aware, for the immunity to extend over so long a period as has happened in this instance. Fifteen years have elapsed since the commencement of the characteristic pains, and as yet no sign of muscular ataxia has presented itself. So long a duration of pains, with exemption from locomotor troubles, is

not, however, altogether unexampled. Charcot and Bouchard have published ('Comptes Rendus des Séances de la Société de Biologie,' Année 1866) particulars of a female patient who died of some accidental disorder after having suffered during fifteen years from lightning pains. Up to the time of her death she walked without embarrassment or projection of the legs; she did not strike the ground with the heels, and closure of the eyes did not affect her security in standing or walking. At the autopsy, the only appreciable lesions (except some doubtful traces of meningitis) were found in the posterior columns, and consisted in a multiplication of the nuclei of the neuroglia, with thickening of the meshes of the reticulum, but without concomitant alteration of the nerve-tubes.

For seventeen years A. B. has suffered from attacks of herpes, and according to his own computation the eruption has come out upon him not less than 180 times. Whilst the pains have been principally referred to the periphery of the sciatic nerves, the accompanying herpes has always, it will be noted, occurred on the skin, which is innervated either by the small sciatic or by the posterior branches of those sacral nerves the anterior divisions of which go to form the sciatic plexus. Some of the pains, it is true, have been referred to districts innervated by the anterior crural nerve; but I think I am right in saying that where these have occurred they have not been alone. On the same occasion the district of the sciatic nerves has also participated in the paroxysms. What appears, therefore, at first sight as a great anomaly, viz. the confinement of the herpes to a very small district, the pains meantime ranging over various parts of the lower extremities, is found to be no longer so much so when we remember that the nerves which supply the skin at the part where the herpes was wont to appear, have a common origin with those which are distributed throughout the length of the lower extremities.

The case of Dr. Charcot's which I have quoted goes far, by exclusion, to show that we may look for an explanation of the lightning pains of tabes to the irritative alteration of the posterior columns of the spinal cord. The researches of Bärensprung especially have shown that inflammation of the

spinal ganglia will produce herpes in the district of the corresponding nerve, and it seems not unfair to conclude that an irritative process attacking the nerve-tubes within the cord would be attended with a like result. The concomitance therefore of herpes, in my patient, with paroxysms of pain, would appear capable of explanation by supposing that such a condition of the cord obtains in his case as was found in Dr. Charcot's patient. But it does not appear so easy to explain the occurrence of herpes *alone* for two years before the pains began. So far as it goes, this circumstance would tend to support the theory of a special system of trophic nerves, which it may be imagined were alone influenced until the growth in the neuroglia attained a certain development. Nor does it seem unreasonable to suppose that the herpes præputialis from which this patient began to suffer when he was twenty-four years old may have been really the first outcome of that diseased condition which has since taken so marked a form. Here, however, we are met by the difficulty of accounting for the fact that trophic disturbances of the skin (like herpes and some other eruptions) are, after all, of very exceptional occurrence in tabes. It happens that I have a case of the kind at present under my care in the hospital, but I do not know that I have had one before. The patient is a man affected with typical locomotor ataxia, who has suffered from highly characteristic pains for the last seven years, the longest interval being a few days. On both legs below the knee, and on the anterior aspect, there is a crop of bullæ. At first the skin comes up, so the man describes it, in a small blister, just as though he had been scalded. This breaks, and discloses (as I could see) red flesh, which was very tender, and which he said might go into an ulcer if irritated, but if not irritated would scab and dry up. One of these places had a scab on it, and this had begun, I was informed, a week previously. The whole duration of a bleb would be about fourteen days. The subcutaneous cellular tissue would appear to be inflamed, as the leg is somewhat swollen, and the skin looks as glossy as a chilblain. The patient began to have these spots five or six years ago. They only lasted a few weeks, and then disappeared till three years ago, when he "knocked both his legs

(owing to his greatly disordered gait), and then they broke out again." Then nothing more was seen until five months ago, when they appeared again after blows upon the legs, and have been coming out pretty constantly ever since. The blebs smart, burn, and sometimes itch. During this time he has pains like electric shocks in both legs, centring in the shins "as if in the marrow of the bones." He thinks that he has had as sharp and continuous pains without as with a coincident eruption.

There can be no doubt about the association of gastric disturbance with lightning pains in the case of the patient A. B. I have watched the commencement and progress of an attack on several occasions, and can confirm his account. But whether, as he supposes, the intestinal irritation set up by undigested food provokes the pains, or whether the indigestion and flatulence are not themselves caused by the same condition, whatever it be, which causes a periodical recurrence of pains, I am not enabled to decide, but should incline to the latter view. As is well known, a tendency to frequent action of the bladder as well as of the bowels is common enough in tabes, to say nothing of the occurrence of seminal emissions, which is so often a result of the malady. In the connection between the abdominal plexuses of the sympathetic and the lumbar and sacral nerves, one is disposed to find an explanation of the coincidence of the affection of abdomino-pelvic organs with that of the lower extremities of the body.

ON THE SYMPTOMATOLOGY OF ALCOHOLIC BRAIN DISORDERS.

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THE large number of cases of insanity which owe their origin, directly or indirectly, to excessive drinking not only makes the observation of such cases, when massed in a large asylum, comparatively easy, but renders it necessary that an accurate knowledge of the varieties and tendencies of this form of brain disease should be arrived at. In the notes which I am about to record I shall not presume to aim at anything like a complete study of the subject, more especially as Dr. Magnan's excellent work on Alcoholism, translated by Dr. Greenfield, has so recently been placed in the hands of the English public. My motive will be to record, in as simple a manner as possible, some casual observations which have been almost thrust upon me while engaged as an assistant medical officer in asylums which have provided shelter and treatment for the insane alcoholic patients of the densely-populated counties of Middlesex and York. For my own convenience I shall speak of cases of alcoholic brain disorder under two heads. The first class of cases will embrace those of which the prominent characteristic is that they show a temporary interference with, and morbid intensification of, brain function. This class will include *delirium tremens* and *mania e potu*, and the classification is, I think, more accurate than would be the case if I were to speak of these disorders as being simply acute; for though they may be acute in the sense of being severe, they are not acute according to the meaning which the term is generally employed to convey—as running a short and definite course.

The presence in the blood and tissues of a poison which it is necessary to eliminate, and the existence of a delirium which multiplies itself as long as the deterioration of nutrition and the instability of the nerve-centres combine to maintain it, constitute a condition which renders precise limitation of the symptoms and course of the disorder impossible. Without any apparent difference in the constitution of a patient, or in the means by which the mania has been induced, the intense furor which sometimes accompanies alcoholic brain disorder may disappear under treatment during the course of a single night, while under precisely the same appreciable conditions the excitement may in another case continue for weeks. In both cases the etiology, the treatment, and the issue may be the same; but the mania is a factor of so versatile and mobile a character that, though the general and ultimate effect of sedative and nutritive treatment may be safely anticipated, the time which will be required for the production of a good result can never be even approximately determined.

Under the second head I shall speak of cases which are characterised anatomically by an essential variation from the normal structure of the contents of the cranial cavity. This group will embrace cases of chronic alcoholic mania not passing into dementia; cases of dementia of which the principal feature is almost absolute loss of memory for recent events; and cases which either verge upon or merge into general paralysis of the insane.

Under the first head I shall at present refer only to the state which bears the most characteristic name—*mania e potu*—inasmuch as simple alcoholic delirium is a disease with which general practitioners are more familiar than specialists in lunacy. When admitted to asylums, patients suffering from mania e potu closely resemble each other even in the details of their history, the nature of their excitement, and in the circumstances of their admission. They have generally undergone an initiatory experience in the police court and the strong cell; are not unfrequently brought to the asylum at night, as if a sudden resolution had been arrived at as to the advisability of regarding the patients as the victims of a disease essentially different from an ordinary attack of delirium

tremens. At times the maniac is firmly secured and accompanied by a body of policemen. His suppressed excitement manifests itself in his expression, which varies in the same individual from abject timidity to sudden and violent emotion and aggressive impulsiveness. The infliction of restraint intensifies the mania in more ways than one. By the employment of force the patient is confirmed in his belief that evil is in store for him, and is driven to bay by the feeling of utter helplessness which, as an external reality, combines with the insane timidity alternating with his outbursts of aggressive excitement. His inability to look upon things in a rational manner places him in a position which corresponds with the experience of an animal in inhaling an anæsthetic. In him the humane motive has the appearance of a purely hostile design, and he experiences all the agony which results from the entertainment of vague notions of coming evil. When relieved from restraint the patient's excitement is almost invariably alleviated, and the administration, forcible if necessary, of liquid nourishment and antacid effervescents, with bismuth and opium, is frequently followed, with comparative speed, by refreshing repose. Sometimes, as I have already said, the effect of concentrated liquid nourishment and sedatives is so marked that one administration is sufficient to produce a comparative removal of the excitement, and the patient begins to be sceptical about the hallucinations which he so recently acted upon with avidity and energy. By a continuation of treatment, and by freedom from restraint, he resumes his former calmness of demeanour, and can not unfrequently fix the exact time of his own recovery by being able to employ his memory in going back, step by step, to a particular hour when reminiscence, first becoming difficult, gradually becomes impossible. He cannot remember the incidents of his excitement, and has only a dim recollection of the nature of his delusions and hallucinations. Unfortunately, however, cases so gratifying in their issue are not often met with. The primary effect of sedation is almost always good, but probably in the middle of the night the patient's sleep becomes less sound, peripheral irritations of a somatic or emotional nature thrust themselves upon the consciousness, and the dreamy thoughts which naturally crowd

into the mind 'twixt sleep and waking again arouse delusions and hallucinations. The patient cannot control his terror or analyse his sensations, and he tries to escape from imaginary foes. If in a single room he may attempt, and sometimes with success, to pass through an iron-guarded ventilator, the aperture of which would seem to the inexperienced to be altogether incapable of allowing the passage of a human body. If in a padded room, he knocks himself about in wild confusion; and if in a dormitory, he generally makes a sudden dart from bed, and rushes wildly forwards in search of some place of safety. But even in such a case the prognosis is rarely unfavourable, and after several sudden outbursts of excitement the maniac—strengthened by the regular administration of digestible and highly-nourishing food, relieved by elimination from the irritating effects of alcohol on the nervous tissues, and soothed by kindly treatment and by such remedies as opium or digitalis—usually regains the use of his reason without showing the slightest trace of dementia; and, after a period of convalescence, is discharged recovered—to resume his ordinary employment, and unfortunately, in too many cases, to resume also the indulgence which compelled him to pass through so trying an ordeal. Though it is evident that in such cases Nature herself performs the greater part of the cure, yet there can be little doubt that some benefit can be obtained by judicious modifications of diet and by the administration of medicines. In the West Riding Asylum I have both in this and other forms of severe mania seen marvellous results produced by the use of a very highly-concentrated essence of fresh meat. This essence is made by placing in a porous covered jar three pounds of fresh meat, free from bone, cut small and without fluid. The jar is placed in the steam-cooking chamber and allowed to remain till the meat is seen to have yielded about a pint of essence. It is salted and simply seasoned with pepper, unless otherwise ordered. With regard to the medical treatment of such cases, I have always placed most reliance on the administration of moderate doses of opium combined with ʒj. or even ʒij. doses of liq. bismuthi. Dr. Magnan, in speaking of such cases as those to which I have just been referring, says, that it is rare in alcoholic mania to have exalted delusions. I

have met only one case of pure mania e potu in which there were delusions of exaltation. Dr. Major, of the West Riding Asylum, has kindly permitted me to peruse this case for the purpose of making a few comments upon it. The patient had had several attacks of mania, all occurring during or after bouts of drinking, and the attack which led to his being brought to the asylum seems to have been one of the worst. Before his arrest he had been collecting crowds in the street, making remarks to them about his great ability, and, in gratitude for their patience in listening to him, had been in the habit of supplying them with drink. When taken before the magistrates, he made a witty defence, which occupied about forty minutes. He talked a great deal about his accomplishments, the colleges he had attended, and his numerous dealings with the aristocracy. Both before and after his admission to the asylum his actions and conversation were characterised by considerable wit and humour. In the prison he constructed an effigy of himself, suspended it by the throat from a fastening, and made signs of distress to attract the attention of the warders, who rushed in after he had hidden himself for the purpose of enjoying their consternation at witnessing the apparent suicide of their prisoner. When on the way to the asylum, he asked to be allowed to look at the certificate, intending to secure it, so as to be able to act the part of a relieving-officer and hand over the warder who was conveying him to the asylum. On admission he was very talkative and witty, and tried to get a reputation for knowledge of languages. He spoke in Latin, but when answered in the same tongue was unable to maintain the conversation. He represented himself to have been a captain in the Engineers, and to have bought a public-house for £5000. This patient made a good recovery, and was discharged in about two months.

This is, no doubt, a somewhat uncommon form of alcoholic insanity, inasmuch as in this instance alcoholism seems to have been an exciting cause acting upon a predisposition to well-defined recurrent attacks which were but slightly tinged with the particular influence of the exciting cause. The only delusions of suspicion which he had were against the police-officers who had arrested him. Two points con-

nected with these attacks of mania e potu seem worthy of passing notice. The first is, that one frequently meets with cases in which within a comparatively short space of time six or eight, or even more, attacks have occurred in the same individual, from all of which he has recovered without the least trace of consecutive dementia. It appears that if the vessels remain moderately healthy, the mania is due to the actual saturation of the tissues with alcohol, and to the tendency which one series of delusions has to cause the formation of another up to the time when the alcohol has been eliminated, and the excitement subdued by proper nourishment and sedatives. The second point is, that a hereditary and collateral tendency to insanity appears to be more than usually common amongst the victims of mania e potu.

In proceeding to speak of the forms of alcoholic insanity in which the presence of some organic change in the cerebral vessels, or the brain substance, is supposed to exist, I have first to mention a form of chronic mania produced by alcoholism, which Dr. Magnan seems to have omitted from his classification. In our English asylums there are numerous cases in which the alcoholic disease manifests itself in the form of recurrent attacks of excitement, generally based upon some delusion of suspicion, or some hallucination of the special senses. Such cases may be of very long duration, and may undergo no change during the greater part of their course. They may commence as uncured cases of mania e potu, or they may be the result of a gradually-developing mania arising from the constant abuse of alcoholic stimulants for prolonged periods. That they are characterised by a decided predisposition to insanity is shown by the fact that they sometimes occur in very young patients, in whom the constitutional condition must have favoured the development of the mania. One of the most typical instances I have ever seen was that of a youth, who was about twenty-one years of age, and in whom delusions of suspicion and hallucinations of sight and hearing were developed with great fertility. A leading feature of these cases is that sometimes the patient may be quiescent, tractable, and industrious for a considerable time, unless his delusions are voluntarily or accidentally aroused; but when

they are touched upon, his excitement is extreme. He threatens violence, and seems frequently to be on the point of employing it, but rarely does so. His speech is voluble and vituperative, and his movements agitated and rapid; but he is comparatively coherent, shows no defect of memory, and no other sign of dementia. In rare cases the patient is sullen and intractable, and given to instantaneous outbursts of violence, of which he offers no explanation, and which assume a homicidal or a destructive character. Such a patient is one of the most dangerous of asylum inmates. Cases which manifest the symptoms of chronic alcoholism of the variety under consideration, present a wonderful uniformity in the nature of their delusions. They are essentially delusions of suspicion. The patients imagine that they have been forced to sleep upon damp beds; that poison has been placed in their food; that electricity has been brought to play upon them; that they have been drugged with morphia, dosed with chloroform, or stifled with sulphurous fumes. They are tortured with voices using the most obscene and threatening language, and regard themselves as victims operated upon by hidden agencies, which act with a subtlety greater than that of magnetism or electricity; and though, when their hallucinations are excessively harassing, they are sometimes driven to attempt suicide, yet their mental agitation has little effect upon their bodily nutrition, and they invariably eat well and maintain excellent health.

What is the physiology, so to speak, of these delusions of suspicion? Some consideration of the subject has suggested to me a principle which I think will hold good, and which will suggest the explanation of such delusions in chronic mania from alcoholism. The principle is that in all cases where the brain tissues, while retaining to a considerable extent their integrity of function, do not receive their proper and sufficient supply of nourishment, delusions of suspicion are apt to occur. Take as a typical case the condition of the mental functions in old age. The advanced senile dement has no delusions of suspicion, but the patient in whom brain-wasting has made less progress, and in whom the physiological tendency to decay is supplemented by privation,

shows marked delusional suspicions. He thinks that his friends are "against him;" that they drug his food, lay plots for the subversion of his interests, or long to be free from the responsibility of his maintenance. The pathological condition in such a case is one which is the result of a physiological diminution of cerebral nutrition. The heart's action fails, the vessels lose their elasticity, the cerebral tissues participate in the general diminution of functional activity, and the diminished *a fronte* combines with the diminished *a tergo* force in reducing the supply of blood. To a certain extent the same pathological condition exists in chronic mania from alcohol. The heart's action is often weak, the abdominal organs often fatty, and the cerebral vessels, especially the smaller branches, are atheromatous, tough, and unyielding. A general tendency to connective tissue degeneration not unfrequently leads to increase of the neuroglia, to the detriment of the proper nerve elements. Similarly, where degraded habits have led to anæmia and cerebral irritability, the same symptoms of mania of suspicion occur; and even in simple cerebral exhaustion—as from overwork—timidity, irritability, and suspicion are apt to show themselves as representatives of the mania which might ensue if proper precautions were not taken. Frequently also in the earliest stages of general paralysis, when alteration of character is first observed, ungrounded suspicions of relatives and friends are manifested. The method of production of these delusions of suspicion seems to be that the modifications in the nature and regularity of the nutrient supply to the brain-cells keep them in a state of excitability—in a condition, so to speak, of dissatisfaction. Now, what are the proverbial effects of hunger, regarded as a general condition? Irritability, excitability, a tendency to put the worst interpretation upon men's motives and actions, and a propensity to hallucinations of the special senses. These very symptoms occurring during sound bodily health are evidently due to the state of the brain-centres as modified by want of food and by reflex excitability. Consequently it is natural that an exaggeration of this condition should result from such a habitual existence of mal-nutrition as accompanies the organic

changes consequent upon the prolonged abuse of alcoholic stimulants.

I have spoken of this condition of chronic alcoholic mania as one which remains almost stationary; but it must be remembered that one condition absolutely necessary for the arrest of the progress of such a disease, is abstinence from the stimulation which induced it. It unfortunately happens that in many cases the first signs of the accession of this mania are not regarded, and the alcoholic, scarcely recognised as being in a critical state, continues his excesses. The pauper patient —usually of comparatively low mental capacity and meagre education—when he begins to manifest symptoms of alcoholic mania, soon develops them to such an extent as to render his recognition as a lunatic imperatively necessary. It is different, however, with the professional man, the artist, the journalist, and the intelligent man of business. The working man's animal propensities usually lie near the surface; his mental operations are less highly specialised than those of the man of refinement; consequently alcoholic changes in cerebral nutrition develop in the latter an initiatory series of symptoms which are not present in the former. How often, for instance, one sees a truly brilliant man undergo a series of painful mental changes directly due to excessive and injudicious indulgence in alcohol. The ready writer, the bright and witty talker, the man of natural æsthetic tendencies with a powerful memory and a gift of ready application has the higher mental faculties in constant operation. He is swayed by changing emotions, and the influence of all forms of excitement, whether emotional, social, or alcoholic, is to intensify, for the time being, the activity of his naturally unstable intellect. When brought into contact with others who manifest the same intellectual tendencies, he has a natural pride in the superiority which secures for him the admiration of persons whose judgment he values; and when exhaustion follows effort, he succeeds in stimulating his weakened powers by alcoholic drinks. For a considerable time, perhaps, while the digestive system remains in such a healthy state as to ensure the supply of proper solid nutriment, this course is pursued with an appearance of success, but soon the urgent symptoms of indul-

gence begin to manifest themselves. The mind, unaided by artificial stimulus, becomes barren and unproductive. Sentences are written that appear to have no point, and jokes are uttered which are destitute of humour. The man who was accustomed to write with speed telling criticisms and pointed epigrammatic sentences, has a consciousness that his mind has become incapable of sustained effort, and that his writing is dull and insipid—a feeling which contrasts strongly and painfully with his previous cheering sense of power and fitness. Under the influence of an alcoholic stimulant, he finds that, for a time at least, he can again command his intellect. But the control is only a temporary one, and is followed by a greater sense of exhaustion than otherwise would have been experienced. Memory, not so much for passing events as for facts, passages, and references, which had been readily acquired, begins to become weakened, and the misery resulting from the loss of a reputation for and consciousness of intellectual power supplies a new incentive to excess. Not unfrequently *petit mal* and attacks of simple vertigo ensue, still showing that the most highly-specialised regions are as yet alone affected. At this stage no one could, as yet, be regarded as insane, though as great a change of function has relatively taken place as leads, in the more lowly-organised mind of the pauper, to the display of delusions of suspicion and hallucinations of the senses. After this, however, if alcoholic indulgence is continued, the ordinary symptoms manifest themselves. Irritability passes into suspicion, voices are heard, illusions experienced, and the mind becoming prone to reverie finds for itself a new and insane sphere of existence. Intellectual helplessness and physical changes advance. One limb may become weak, one pupil may dilate, and, if excessive or even moderate drinking is still indulged in, the victim has no other prospect than to end his days in a state of degraded dementia and muscular paralysis from progressive brain-softening.

There is another well-pronounced class of cases which owe their origin to excess in alcoholic drinks, and which possess some interesting features. In this class the patients are generally advanced in life, are not unfrequently women at the menopause, and generally bring with them a history of

excessive drinking suddenly abandoned. The feature of such cases which is sufficiently striking to give character to them is the almost absolute loss of memory for recent events. The patients are cheerful, attentive, understand what is said to them, and show little dementia as far as simple processes of reasoning are concerned, but are absolutely destitute of memory for passing events. When the medical officer makes his visit (perhaps the third in the course of the day), and asks, "Have you seen me before?" the patient asserts that he or she has not; and the constant ineffectual repetition of this question at short intervals, shows that the capability of retaining new impressions has completely disappeared. I do not mean to assert, however, that all such cases are necessarily of alcoholic causation, but only that they are a frequent result of alcoholic excess. In fact, I think that in cases where organic change has been produced in the brain, the nature of the symptoms will be determined, not so much by the character of the exciting cause, as by the physiological functions of the regions diseased. The same complete failure of memory, for instance, as I have just now commented on, is frequently present in specific disease of the brain; and Dr. Major has drawn my attention to a case in which the exciting cause was the shock produced on the patient by the death of her husband. Though the mention of the circumstance of her husband's death always produced in her the most painful emotions, it was on each occasion accepted by her as a novelty. Each time that the lamentable event was mentioned she regarded the information as something she had never heard before, and the grief she manifested was consistent with this remarkable forgetfulness. Still in other respects she was comparatively rational.

In such cases there are not, as a rule, the other ordinary symptoms of dementia. The patients are not dirty in their habits, sometimes employ themselves, are interested in immediate impressions, but retain no recollection of recent experiences. Such cases seem to begin with comparative suddenness, and may terminate—after a considerable interval, in which loss of memory has been the leading symptom—in apoplexy, epilepsy, hemiplegia (from clot or progressive softening), or in

simple brain-wasting. In such cases there are no paroxysms of excitement, but there is a tendency to general weakness of the muscular system, and a cheerful expression and insane laugh, which, however, cannot be confounded with the look of fatuous rapture which adorns the face of the general paralytic.

The last class of cases of alcoholic etiology to which I shall refer, are those which are frequently difficult to diagnose as distinct from general paralysis. They simulate that disease strongly, and may even merge into it. They occur principally in men somewhat beyond the age commonly assigned as the period at which general paralysis manifests itself. In one respect, also, they are peculiar, inasmuch as the history of the cases generally begins with an attack of what would have been formerly described as brain fever. An attack of cerebritis in a man of 48 or 50, who has been much addicted to alcohol, may leave him in a state of almost absolute dementia and partial paralysis. When he attempts to stand, his knees bend under him. He is degraded in his habits, and eats ravenously. He rarely speaks; but when he does, it is usually to express exalted ideas. His manner may be habitually sullen, or constantly cheerful and fatuous. For a few months his symptoms may show no modification, when suddenly he may burst out into an attack of aggressive excitement. He shows symptoms of a new attack of encephalitis, and, though completely helpless, manifests by his conduct the presence in his mind of delusions and hallucinations. His attempts at violence towards those of whom he knows nothing, and whose motives are humane, show the existence of the former, and his rushing or striking at imaginary objects is sufficient evidence that he is actuated by the influence of the latter. Self-mutilation reveals the existence of some important mental aberration, and I have known one instance in which a patient, strongly alcoholic in his history, and whose case presented such features as I have sketched, lacerated his body with his teeth in a most serious manner. In such cases counter-irritation of the shaven scalp, and the internal administration of digitalis or aconite, sometimes produce wonderfully beneficial effects. After each attack of excitement such patients are seen to lose more and more the use of their limbs. They become more and more

demented, and have recurrent attacks of excitement which close observation ascribes to groundless suspicions and half-expressed hallucinations. They are rarely convulsed, and in this respect, as well as in the nature of their delusions and hallucinations, and in the rapidity of the course of the disorder, they show a decided divergence from the typical course pursued by general paralytics. After death they may be found to have brains presenting no meningeal adhesions, and little frontal wasting, but, on the other hand, showing greater evidences of inflammatory action than those which are found in general paralytic brains. The white matter is often firm and glossy, and tinged with all colours, from a delicate pink to a faint cardinal hue. The cortex is, as a rule, fairly thick and deep in colour. The small vessels are generally tough and coarse, and the large vessels atheromatous.

My object in this paper has been to speak of the features of several well-known and other less-known forms of alcoholic brain disease. I have not referred to alcoholic excess as a cause of general paralysis, except in so far as my last class of cases sometimes contains instances which merge into that disease. I consider that the relation which alcoholism bears to general paralysis is capable of a much more scientific explanation than any which has yet been offered. That explanation will, I believe, come from those who combine a knowledge of microscopy with an appreciation of the most recent views regarding cerebral physiology. I have confined myself to a statement of the symptoms of such cases of alcoholic brain disease as special privileges have afforded me the opportunity of studying, and it seems to me that experience points to the fact that excessive or injudicious indulgence in alcoholic drinks causes cerebral irritation, mal-nutrition, and probably inflammation, which, according to certain special conditions, lead to delirium, delusional mania, chronic excitement with exacerbations, and even to loss of memory, muscular prostration, exhaustion, and death.

THE NEUROSAL AND REFLEX DISORDERS OF THE HEART.[1]

BY J. MILNER FOTHERGILL, M.D., M.R.C.P.

It has been stated by more than one writer on the diseases of the heart, that when a patient complains directly of his or her heart in the physician's consulting room, usually no disease is present, but merely a neurosal condition. Probably the only exceptions to this rule are those who have previously learnt from some other medical man that they have some mischief about the heart. My own experience goes to corroborate this expression of opinion. The person who really has heart disease makes complaint of some consequence thereof, as dyspnœa on exertion. Frequently valvular disease is detected by the usual physical examination of patients, and the patient is unaware of anything being amiss with him: in such cases the compensatory muscular growth is sufficient, and is not failing. But when the nervous mechanism of the heart is disturbed, then the patient is acutely conscious that something is wrong, and usually is greatly alarmed and filled with dreads. Perhaps of all patients with neurosal affections of the heart who present themselves to the physician, medical men are the least satisfactory. Unfortunately for their peace of mind, they are but too familiar with the insidious approach of some forms of cardiac disease, and therefore cannot dismiss from their minds their fears and apprehensions as to the interpretation of their symptoms, on the physician's word. Ordinary patients are only too glad to take the physician's word for it that there is

[1] The concluding lecture of a series delivered at the West London Hospital on the Causes and Course of Diseases of the Heart, with Special Reference to Prevention and Treatment.

ne disease, and go their way rejoicing—for it is a characteristic of humanity that it readily believes what it wishes to believe. But the unfortunate doctor himself is not so easily satisfied, and thinks the matter over and over by the light of possibilities, until all comfort is gone, and he has worked all his dreads and doubts into full action again. The consequence is, he is little or no better for the consultation, and the physician achieves no credit. Such, at least, has been too much my experience; though not invariably the case.

The circulation is closely linked with the emotions, not only the heart but the peripheral vessels with their large muscular walls. In joyous emotion we find the peripheral vessels dilated, the extremities warm, and the heart beating vigorously. On the other hand, dread and anxiety contract the arterioles, the face is pallid and the hands are chill, the blood-pressure in the arteries is heightened and the renal secretion is profuse. This is well marked in candidates for examination, whose frequent retirement has given rise to a peculiar expression, which, however, cannot be mentioned here. The same condition is found in hysterical attacks, which usually are followed by a copious discharge of urine of low specific gravity. These effects of emotion upon the circulation have not escaped the attention of poets and novelists, and Charlotte Brontë, in 'Jane Eyre,' makes Mr. Rochester feel Jane's pulse when he wishes to assure himself that she will not flinch or turn sick at the sight of blood. "'Just give me your hand,' he said, 'it will not do to risk a fainting fit.' I put my fingers into his. 'Warm and steady,' was the remark." There was no palsying terror there—the circulation was free and unconstrained.

The blush is an emotional disturbance of the peripheral area of the vascular system, and the Germans term it "Schamroth." It extends over the whole cutaneous area, and is not merely confined to the face and neck, though of course it is seen there chiefly. Dieffenbach was once examining a tumour on the pudenda of a lady, when she blushed, and this blush extended over the nates and thighs of the patient. Palpitation often accompanies the blush, because the dilatation of the arterioles suddenly lowers the blood-pressure in the arteries, and the ventricle having less obstruction to overcome, strikes the chest

walls violently; the more, too, that the emotional state probably also affects the cardiac ganglia. Some persons possess a power of voluntary control over these emotional disturbances of their vascular system, which is called coolness. This is well shown in the steady hand of the practised rifle shot, where a bounding pulse would disturb the aim; and in the coquette who has subordinated the natural tendency to blush to the control of her will. This power of controlling the pulse is effectively utilized by writers. Thus Sir Walter Scott, in the 'Talisman,' makes Saladheen visit Richard Cœur de Lion when wounded, assuming the disguise of an Arabian physician. Before taking the draught offered, the king takes the Saracen's hand, and feels his pulse: "His blood beats calm as an infant's," said the king; "so throb not theirs who poison princes." Similar expressions are to be found elsewhere, even in the pages of Boccaccio. This power of voluntary control over the circulation exists in some persons to a very marked extent, even to the arrest of the heart's action. The well-known case of Colonel Townsend has often been alluded to by different writers. He possessed the power of arresting the action of his heart, and at last killed himself by an exhibition of it. A well-known physiologist in England has also great power in this respect, but he is chary of exercising it. Disturbance of the rhythm of the heart is one of the outcomes of cerebral disease, and is of bad prognostic omen. It is found in hydrocephalus, in compression of the brain, and in inflammation of the brain (Marshall Hall). A curious instance of disturbance of the rhythm of the heart due to cerebral causes came under my care lately in the person of a medical student. He was a tall and stalwart fellow, of good family history and excellent physique, but whose heart had acquired the trick of beating unrhythmically. When examining him one day with my ear on the stethoscope, I asked him a question which caused him to think a moment. At once the rhythm was distinctly changed and the action was slowed, and there were intermissions. In after-visits I repeated the experiment with uniform results. If the question put involved no thought, the heart's action remained unaffected. If it entailed thought, then cardiac irregularity was produced.

Disturbance of the heart's rhythm may also be induced by pressure on the vagus nerve. The famous Czermak, of Prague, had a tumour in the neck lying over the vagus. By pressing this tumour on the nerve, the heart's action could be slowed, or even arrested. Romberg, in his famous work on Diseases of the Nervous System, relates a remarkable case which occurred in Professor Heine's wards in Vienna, of a long ventricular halt from a tumour involving the vagus. "There was an intermission of five or six beats of the heart and the pulse. The aspect of the patient showed that at the time something terrible was going on within him; he sat there as if thunderstruck (attonitus), speechless, motionless: his eyes wide open, his consciousness unimpaired" (vol. ii. p. 340).

Of the neurosal maladies of the heart, angina is one. We know little of neurosal angina, except that it is found very commonly in women at the change of life. It may be a very terrible affection, and yet pass away and leave no trace behind it. It must be discriminated from the true angina pectoris which is caused by spasm of the peripheral arterioles, which raises the blood-pressure in the arteries, and so embarrasses the heart. Transient attacks of this true angina often cause great suffering, but as long as the heart walls are sound there is no great danger; but when the muscular walls are undermined by fatty degeneration, sudden death is a common result. This true angina is most frequently seen in men of gouty history, and is relieved by the administration of potash, and an abstinence from albuminoid foods. Neurosal angina is more influenced by arsenic, perhaps, than any other remedial agent. I have seen recurring attacks of true angina in comparatively young men whose fathers died of angina. They yielded readily to treatment: and yet these men may ultimately die in the same way as their fathers did.

The ordinary neurosal disturbances of the heart are (1) palpitation, (2) irregularity, and (3) intermittency—putting them in their order of gravity; for, though intermittency is a disturbance of the nervous mechanism of the heart, it usually occurs under circumstances which lend it great gravity. Palpitation is excited action of the heart; and may vary from the temporary disturbance caused by emotion or excitement in

perfectly healthy persons, to a persisting condition of the most annoying character. With some persons the heart's action is so disturbing that it causes them great discomfort, interfering with their work, preventing them from falling off asleep, or waking them suddenly and alarming them. Such a heart might be designated "a badly-behaved heart," for its behaviour is very bad indeed. These hearts are very intractable, and are not readily influenced by treatment. Among the out-patients of this hospital are two, mother and daughter, possessing this form of heart. The mother has become practically cured by a long course of quinine with hydrobromic acid; but the daughter's case is much less satisfactory. In both there is a highly-developed nervous system. In another case, a Jewess, at the Victoria Park Chest Hospital, the heart's action was very tumultuous. Being anæmic, she was treated with bromide of potassium and iron. After several weeks, during which no relief was afforded, suddenly the case took a turn, and great improvement set in, her heart once more beating like other people's hearts. In these cases it would seem that the heart is swung in an unusually delicate nerve balance, so that its action is perturbed by slight causes which do not affect other people. Just as there are persons whose stomachs are easily deranged, others where the liver is readily disturbed; so there are those whose brains are quickly upset, and those whose hearts beat excitedly from very slight causes.

Palpitation is a phenomenon about which it is very desirable to have clear and perspicuous views; and in order to attain to this, it becomes necessary to be familiar with the circumstances under which it arises. It may be neurosal, or it may be due to muscular embarrassment; and for its successful treatment it is essential to be accurate as to its causation. It will be well to take the muscular form first, and get rid of it. It was stated in the second lecture that hypertrophy of the heart was due to increased internal pressure within the heart. We know that when blood is experimentally forced into the heart under abnormal pressure that more rapid and more powerful ventricular contractions ensue, and that too when the vagi are cut. Further, when a motor nerve is irritated, the blood-vessels of the muscles, set in action, are dilated, and so a

fuller supply of arterial blood is furnished to the parts that are functionally active. Consequently increased internal pressure within the heart leads to hypertrophy in well-nourished persons. When the hypertrophy is insufficient, palpitation is common. When the chambers of the heart are unduly distended, its sensory nerve is thrown into action. Not only are more powerful and rapid ventricular contractions set up by the discharges of the cardiac ganglia, under these circumstances, but this sensory nerve is also the vaso-inhibitory nerve dilating the peripheral vessels (Rutherford). Such dilatation of the terminal vessels allows the blood to escape easily out of the arteries, and so lessens the amount of obstruction the left ventricle has to overcome on its systole. Without this last arrangement, palpitation would be the usual outcome of effort. Palpitation, or a condition closely allied to it, is induced in most persons by rapidly mounting a flight of stairs, or some similar exertion. By effort the arterial blood-pressure is raised, the heart has more to overcome, and so the internal pressure in it is increased. An aortic cusp is not unfrequently torn down by violent effort. In hearts which are dilated or the subject of valvular disease, effort readily produces palpitation, which is here an active indication of debility. The effect of an altered arterial tension upon palpitation is well shown by the following case:—An old patient, a Westmoreland peasant, with long-standing mitral disease, wrote me lately to this effect: "I have frequent attacks of palpitation, followed by a feeling of suffocation, continuing from ten minutes to half an hour; they then pass off, leaving nothing disagreeable. I am suffering from a cold I got three weeks ago, and, what is most singular, I never have palpitation when in that state." This is a most suggestive statement. In persons with atheromatous arteries and hypertrophied hearts, the subject of chronic Bright's disease, the ordinary square-headed pulse tracing is altered by a cold, a pyrexia, into the pointed tracing of a febrile condition. The change is exactly like that worked in the circulation of such persons by the inhalation of nitrite of amyl—an interesting experiment, showing at once how profoundly the circulation is modified by dilatation of the peripheral vessels. So in this man, with a

heart crippled by valvular disease, he often has palpitation. But when the blood-pressure in the arteries is lowered by the effects of a cold, the heart can easily overcome any obstruction then offered, and there is no palpitation. This fact throws great light upon the causation of palpitation by effort, and explains how palpitation is readily induced when the heart is weak.

In the subjects of gout, or lithiasis, there is a condition of high blood-pressure in the arteries caused by contraction of the peripheral arterioles. When the blood is abnormally impure there is often arteriole spasm, causing a sudden further rise in the blood-pressure in the arteries and embarrassment of the heart. This is the pathology of true angina pectoris. More commonly, however, the cardiac embarrassment is manifested by an attack of palpitation. Probably in each case the attack is relieved by the action of the sensory nerve, just alluded to, which dilates the peripheral vessels and relieves the heart. In such palpitation it is well to follow this natural method of relief, and to dilate the peripheral vessels by nitrite of amyl.[1] Having cleared away these two forms of palpitation, we may consider the truly neurosal forms.

Neurosal palpitation of the heart may be primary or reflex. The reflex forms of palpitation are very common. They are often due to uterine disturbance, and still more frequently to ovarian trouble; but they may be produced by some condition of the stomach or of the intestinal canal. Thus prolapsus of the womb will frequently set up severe palpitation, relieved at once by the replacement of the womb. So ovarian congestion will cause palpitation, and other neurosal disturbances. We know that, if a number of ivory balls be hung in a row and the end one struck, it is the ball at the other end which flies from its place. So in nerve disturbances the perturbation is not felt where it commences, but where it runs out. The localised spots of pain connected with visceral derangement are well known. In liver derangement, pain is often felt in the terminal cutaneous twigs of the acromial nerve at the

[1] This form of palpitation is more common with women than men, as in chronic Bright's disease men usually have cardiac hypertrophy, while in women the hypertrophy is commonly blended with dilatation.

point of the right shoulder, or in a twig of the sub-scapular nerve under the right shoulder-blade. So in ovarian disturbance waves of nerve perturbation are set up which traverse various nerve fibrils, and cause different results according to the route pursued and the track taken. If the wave passes to the stomach, we have dyspepsia (see an article on Ovarian Dyspepsia, 'American Obstetrical Journal,' Jan. 1st, 1878); if to the cardiac ganglia, we get palpitation: and both these maladies, to which women are so much more liable than men, are commonly reflex, and due to the condition of the ovaries. Or it may travel to the respiratory centre and set up a neurosal cough. At other times it passes out at the cutaneous terminations of the facial nerves, or of the intercostals, especially the sixth and seventh, where it is felt as a gust of neuralgic pain. This is the explanation, in all probability, of the "pain under the heart," so commonly complained of by women. In reflex palpitation of the heart it is essential for successful treatment to bear in mind its causal associations. It is well to put a blister over the ovary, usually the left one, to open the bowels and relieve the ovarian congestion by sulphate of magnesia, and then to deaden the conductivity of the nerve-tracts by full doses of bromide of potassium. By such a line of treatment excellent results can be attained in a very troublesome class of cases.

The heart was regarded by the older physiologists as the seat of the emotions, and it is certainly in intimate relation with the reproductive organs. In some women the sexual act excites such palpitation that their marital relations have to be completely suspended. The same is found to a less extent in men. Disturbed cardiac action is often so associated. Depression of the vascular system is often a cause of malaise and a feeling of "not feeling well," so frequently found in persons living under favourable circumstances; as country clergymen, for instance. In my experience this is rather the case with married than single clergymen; and on accurate analysis it will be found that it is not the discharge of their social, nor yet of their parochial, but rather of their spousal duties that is telling on them. This cause of cardiac disturbance is one

familiar only to practitioners of some experience, and is a very delicate subject to deal with.

Then we must admit that there is a form of palpitation which is truly neurosal, a neurosis of the cardiac ganglia, just as whooping-cough is a neurosis of the respiratory centre. It is usually found in girls, and consists of paroxysms of violent action of the heart, when the pulse is comparatively quiet. As to its presence in cases of chorea and in Graves's disease we can entertain no doubt. As to its mode of production we at present know little. Trousseau denominated Graves's disease a neurosis of the sympathetic, and Niemeyer thought the vaso-motor nerves of the coronary circulation chiefly affected. In chorea and in Graves's disease the action of the heart is sometimes so violent that it seems as if it would shatter off the walls of the chest over it. The treatment of such palpitation is not very satisfactory. In chorea, and in those cases where, as is said before, there is a "badly behaved heart," bromide of potassium is of great service, and may be given alone or with iron. Or quinine and hydrobromic acid may be tried. In all cases it is well to search out and get rid of any source of reflex irritation. Botkin of St. Petersburg ('Maladies du Cœur') relates a case where excited action in the heart was kept up by a floating kidney. In the treatment of these cases of neurosal palpitation great patience is requisite both for doctor and patient, and each case must be studied separately, and the condition of the circulation generally carefully appraised, for any success to be attained.

In considering the neurosal affections of the heart the question arises, "Are the nervous disorders of the heart on the increase at the present time?" To this question an affirmative answer must be given. Probably the increase is less marked in women than in men; and some forms of palpitation must have existed amidst the spouses of primitive man—long before advancing culture had rendered the nervous system of women so sensitive as we now find it. Still it may be affirmed that the increasing delicacy of the female constitution renders them more liable to neurosal disturbances generally, and with that to cardiac disorder. But in the case of man, the present keen struggle, not for existence merely, but for success is

telling severely on the nervous system. The battle of life is now fought, not by thews and sinews, massive bones and mighty muscles, but by active brains and keen wits. The brunt of life's struggle is now mainly borne by the nervous system, and it suffers accordingly. One overworked man will have cerebral symptoms; another will have a disturbed heart. Want of sleep, anxiety, overwork, are the causes of a great deal of cardiac disturbance now presented to the physician. The symptoms simulate those of a feeble heart, and are often taken, or mistaken for them. They are indeed due to exhaustion of the cardiac centres, and are recovered from by rest and quiet. A form of cardiac disorder hitherto undescribed was carefully delineated by Dr. Da Costa of Philadelphia, after the excitement of the recent American civil war. He denominates it "Irritable Heart." He found it usually amidst men who had been engaged in active service, and who had had either ague or diarrhœa, or something which pulled them down. After a short stay in hospital the patient would rejoin his command, but soon found that he was not equal to his duties as before. He would have attacks of dizziness and palpitation on the march, so that he would have to be invalided. The heart's action would be excited and irregular, the number of beats more per minute on assuming the erect posture was from twenty to forty, the respirations not being proportionately increased, and exertion was badly borne. It did not always occur with conditions of cardiac debility, and in some cases the heart was hypertrophied. (Here trophic changes followed excited nerve discharges—nervous hypertrophy.) According to the associations was the line of treatment to be adopted: where there was debility, digitalis, strychnia, and belladonna were most useful; but with hypertrophy, aconite was the agent most serviceable. Dr. Da Costa observes, the treatment is never a short one, and my experience tells me that that is true of all the neurosal affections of the heart.

The next form of disturbance to be considered is irregularity, a brief pause not extending over a complete cardiac revolution, as is the case in intermittency. Dr. B. W. Richardson describes it thus: "It is like a smith who, striking a forge in

rhythmical succession until tired, changes the action for a moment to give a more deliberate and determinate blow, and then rings on again in regular time." To me it has always seemed to resemble the change in a horse's feet when cantering: tiring of leading with one foot, it suddenly changes and leads with the other foot for a time, then changes again. Sometimes the beat after the brief pause is stronger than usual, as if the longer the discharge of the cardiac ganglia had been kept back the more powerful it became. This irregularity is commonly found with cardiac dilatation, and the apparent "roll over" of the heart is most characteristic, and once experienced never forgotten. If the irregularity occur at distant intervals and is not influenced by exertion, then it is of no significance. But if, on the other hand, it is increased in frequency by effort, then its diagnostic and prognostic value is very different. It is very frequently found with dilated hearts and with mitral disease. It may be a mere nervous phenomenon, or its import may be grave: its importance depends upon its surroundings. In reference to irregularity, George Balfour quotes the lines of Ballatyne,

> "My vera heart gaes loup, loup,
> Fifty times a day;"

and this describes well the condition of an anxious mother with a feeble heart.

Intermittency is a halt extending over a whole cardiac revolution. B. W. Richardson says that the auricular contraction fails to set up the subsequent ventricular contraction which normally follows, and a second auricular contraction is required to start the ventricle off. Experimentation on rats some time ago enabled me to corroborate this statement, and as the animals died even more than one extra-auricular contraction was required to start off the ventricle which paused over three, or even four, auricular contractions. When the ventricle, however, did contract, its contraction was a continuous movement of the auricular contraction. So much for its mechanism; but what is its significance? That varies with its concomitants. To B. W. Richardson are we indebted for the demonstration that it may be a nervous phenomenon of

little or even no significance. He found it follow terror during shipwreck and to disappear in time. In another it was induced by grief, and occurred twenty-three times in the minute, but fell under treatment to twice only in one hundred and sixty beats. In a third case it was brought on by passion. From two cases recorded by him it would appear that it may be to some extent hereditary; while he found it once in an infant at birth, persisting till the fifth year; and once detected it in a marked form in a dog. Now, Dr. Richardson is quite right in insisting that it is a nervous phenomenon, and that it is due to an arrested discharge of the cardiac ganglia; but nevertheless it is commonly found under circumstances which lend it gravity. Where the intermittent halt occurs at rhythmic intervals, it is usually neurosal only; but if it occurs at irregular intervals, and more especially if it be increased by exertion, it is significant of organic changes going on in the structures of the heart, usually of a degenerative character. Intermissions in the heart's action are very common in the moribund condition, when the ventricle pauses over one or more auricular contractions.

Whenever the halt is so long that the blood-pressure on the brain is lowered, then the patient suffers acutely. Two such cases I have seen where the halt lasted over four ordinary cardiac revolutions, and the patients' features told of the horrible sensations which were going on within them, reminding me forcibly of the account given of Heine's patient. Dr. Richardson says, "The man or woman with a hesitating heart is thereby unfitted for sudden tasks, demands, resolves, which, when the heart is firm, are considered comparatively of little moment: for when the heart hesitates, the brain, which reposes for its power on the blood the heart supplies to it, falters with the heart, just as the gas flickers when the steady pressure is taken off the main." It is this matter of imperfect blood-supply, especially to the brain, which makes intermittency of the heart's action serious, or not, as regards its effects. This halt of the ventricle over a complete cardiac revolution must be distinguished from that form not uncommon with aged persons, where the intermission is due to a ventricular contraction too feeble to affect the radial pulse. Here,

on examination with the stethoscope, it will be found that the cardiac contractions are regular and rhythmical, but that they vary in power: the bulk reach the radial pulse, but others fail to do so; so that there is an intermittent radial pulse without true cardiac intermittency. Dr. George Balfour relates a case of an old gouty lady who was attacked with syncope, where he found the radial pulse only twenty in the minute. On examining the heart he found it beating "with perfect regularity, but with unequal force, so that the apparent abnormal slowness of the pulse was simply due to the fact that only about every third beat reached the periphery." Dr. Hayden says, "True intermissions usually occur at short but unequal intervals of time; they are most frequently met with in old persons otherwise apparently healthy, and associated with a weak cardiac impulse, and clear sharp sounds; the arteries are likewise usually tortuous, and often atheromatous: in short, the symptoms and signs of dilated heart and atheromatous degeneration of the arterial system are usually associated with this form of intermission." My experience is quite in unison with that of Dr. Hayden, and intermittency is commonly found along with evidences of muscular failure, and frequently with indications of some fatty degeneration. We saw in a preceding lecture that when the arteries become atheromatous they lose much of their elasticity; and as this change goes on in the aorta, —while the coronary arteries become thickened and their lumen diminished, their tortuous condition breaking the blood-current through them,—the structures of the heart become imperfectly nourished, and degenerative changes ensue. Intermittency of the heart's action is not due to muscular failure, except in the spurious form just described, but to a delay or failure in the rhythmic explosions of the cardiac ganglia. This may be due, as in Heine's case, to some irritation in the vagus, but in the very great majority of cases it is due to some change in the cardiac ganglia. They, like the muscular structure of the heart, may be imperfectly nourished, and so discharge unrhythmically. So far as I am aware no examination has yet been made of the condition of the cardiac ganglia in cases of fatty degeneration of the muscular walls, and a comparison of such ganglia with those from perfectly normal

hearts; but it is a matter well worth investigation. From what has been said of intermittency it is clear its import is derived from its surroundings and associations. In some cases intermittency is found along with palpitation, especially in gouty females of middle age. When such an attack comes on at dead of night, it is very alarming, and the complaint made is usually to this effect: "I am not so afraid when the heart is beating loud, for then I know it is going; but when the stoppage comes, I feel as if I were going to die;" and no doubt when the brain falters from an insufficient supply of arterial blood to it, the sensations are very unpleasant, and add to the alarm caused by the apparent stoppage of the heart. Intermittency so associated has occurred in my experience chiefly in women of neurosal diathesis. The treatment of intermittency is the treatment of the condition with which it is associated. When neurosal, it may be treated by tonics and iron; when concurrent with fatty degeneration and waning power in the heart, digitalis may be added; and if it occur in persons decidedly gouty, a little potash with the digitalis will be useful. Under such treatment intermittency will often disappear for a considerable time; but it would be a mistake to think therefrom that any permanent good had been achieved. The evidences of failing power will again show themselves in time.

Closely allied to intermittency is the very slow pulse of some persons, and even of some families. Such a case was sent me some time ago by Mr. Pugin Thornton. It occurred in a young woman, who had disease of her larynx. The heart beat only some twenty times a minute, yet it did not affect her injuriously, and she had no fainting or syncope. Persons with slowly acting hearts are rejected for military service, but on what precise grounds I have not yet been able to ascertain. Some years ago, in Berlin, I was consulted about a young gentleman whose heart beat some forty times per minute, and who was so rejected. He was an active man, given to hunting and other energetic practices, and would no doubt have signalized himself as well on the march as in the boar hunt, had the opportunity been furnished to him. If there are evidences that the system, and especially the brain, is suffering from an

insufficient supply of arterial blood in consequence of the slow action of the heart, then it would be a malady; under ordinary circumstances, it is only a peculiarity. In one family known to the writer all the members of it have a slowly-acting heart; yet they are an active family, and in no way suffer from this leisurely action of their cardiac ganglia.

The explosive discharges of these motor ganglia are affected by temporary conditions of overwork and worry, especially when combined with an insufficiency of sleep; and much cardiac irregularity, with lack of power, is so produced. At other times temporary depression is set up by an attack of diarrhœa or a debauch. Here probably there is some failure in the muscular structures as well as the ganglia. Such cases of sudden failure are not uncommon among mountain climbers, and the guides of the Tyrol are familiar with this state, where the affected person loses all nerve and power, and has to be got down the mountain-side as well as may be. This occurred once to an American friend of mine in Vienna, a man of iron nerve and will ordinarily. More than one such case of cardiac failure on the Righi has come under my notice.

Irregular action of the heart is like a murmur; it is much easier to detect it than to exactly appraise its significance. From this point of view cardiac diseases are not matters to be settled by the stethoscope, though that instrument may furnish valuable information. Serious organic change may be simulated by conditions which are not really grave; and the neurosal and reflex disorders of the heart are matters for the careful consideration of the practitioner.

THE EFFECTS OF SECLUSION ON THE BODY WEIGHT.

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THE effects of seclusion as a remedial agent in the various forms of insanity is a subject on which considerable difference of opinion still exists in the writings of those best able to judge of its results; and it was suggested to me some time ago by Dr. Crichton-Browne that certain facilities existed in a prison for determining with greater accuracy than could be attained in an asylum some at least of the physical effects of this form of treatment. The present note refers to one only of these; namely, the loss or gain in weight. The body weight of prisoners, both as an indication of their physical condition while in gaol, and as showing the normal variations in the nearest approach to a state of "physiological rest" we can probably arrive at, has been already investigated with great minuteness; one of the most important papers on this subject being that published by my predecessor, the late Mr. Milner, while in charge of the convicts at the (then) West Riding Prison.[1] He there shows from an analysis of 4000 cases the influence exerted on the weight by certain conditions he selected for investigation—namely, the season of the year; the period of imprisonment; the employment in prison; the age and height of the prisoners. As it did not fall within the scope of his communication to trace out the effects of the different forms of seclusion for prison punishment, I commenced a number of observations with the view of supplying this

[1] 'Sanitary Review,' January 1859.

deficiency. The county prisons, however, at the beginning of the year passing into the hands of Government, the whole of the conditions as regards diet and punishment for prison offences have been so materially changed as to render it necessary to bring the present series to a premature conclusion. I should not have thought it worth while to publish the results of the few I had collected before the alterations, were it not for the fact that, under the regulations of the new Prisons Act, the number of days during which a prisoner can be kept in the dark cell has been reduced from three to one, so that the opportunity will not again occur of observing the alteration in the weight caused by the longer period of confinement.

The forms of punishment seclusion investigated were four, commonly known as the dark cell, the half-light cell, solitary, and off association. The following is a brief description of the conditions under which prisoners are placed in each:—

Dark Cell.[1]—The dark cells have a capacity of a little over 800 cubic feet, are ventilated, and in winter warmed, artificially. They are absolutely dark, and almost, but not quite, sound proof: prisoners placed in adjoining cells can undoubtedly communicate by shouting loudly. The diet consists of 6 ounces of bread for breakfast and supper, and 4 ounces for dinner, with a pint of water for each meal. The prisoners wear the same clothing as at other times, except that their neckerchief, apron, and cap are taken away. They are allowed two rugs at night, and sleep in their clothes on a wooden or plank bed. They are visited five or six times a day by the warders, and by the matron, chaplain, and surgeon, daily. The period of confinement varies from one to three days, and the prisoners are usually in a good state of health, as the surgeon has the power of recommending their removal from punishment, or its non-infliction, if he believes them to be mentally or physically unable to bear it.

Half-light Cell.[1]—The half-light cells are of two sizes; the smaller have a capacity of about 580, and the larger about 800 cubic feet. In the former, light is admitted through a bull's-eye

[1] As a form of punishment these really come under the head of "Solitary," but for the purposes of the paper it has been thought better to consider them separately.

window; in the latter, through an iron shutter pierced with holes placed in front of the ordinary window. The light is dim, but sufficient to read by. The inmates are allowed a Bible and Prayer-book, and have their bed in at night. The other conditions as regards diet, &c., are the same as in the dark cell.

Solitary.—During solitary confinement the prisoners are kept in their own cells, which vary in different parts of the prison from 800 to 1000 feet in cubic capacity. The bed and bedding are taken out during the day, but given in at night. The prisoners have no work of any kind, but a Bible and Prayer-book are allowed to those who can read. The diet and the clothing are the same as in the dark cell; and the duration of punishment likewise never exceeds three days.

Off Association.—When taken off association, prisoners are simply confined to the ordinary cell for a varying period, not being allowed out either to exercise or chapel. They have the regular work and diet belonging to their particular class or stage. The period of confinement in the cases noted varied from three to fifty-eight days.

The total number of observations was 134, and the results were as follows:—In the dark cell cases the number of observations was nineteen, the average length of time under punishment being 2·5 days. Fifteen prisoners lost weight; two gained; and two remained stationary; the net result being an average loss of 0·85 lb. per prisoner per day. The extremes were a loss of 2·1 lb. and a gain of 0·5 lb. a day. In the half-light cell, a much less frequent form of punishment, there were only seven observations. All the prisoners lost weight, and at the average rate of 1·11 lb. per day. The average length of time under punishment was 2·4 days; and the greatest loss 2·6 lb. a day. Out of seventy-two prisoners who underwent solitary confinement, sixty-six lost weight, three gained, and three remained unchanged. The average length of time under punishment was 1·8 days; and the net result an average loss of 1·27 lb. per day per prisoner; the extremes being a loss of 6 lb. in two days, and a gain of 2 lb. in one day. Thirty-six prisoners were taken off association. Of these sixteen gained weight, sixteen lost, and four were unaffected. The average length of time under punishment was

11·7 days, and the net result an increase of 0·04 lb. per day per prisoner. The average increase of those who gained was 0·22 lb., and the decrease of those who lost 0·19 lb. a day; the extremes being a loss of 0·03 lb. and a gain of 0·6 lb. a day.

It is found, as a rule, that short-timed prisoners are heavier on discharge than on admission. It is difficult, as the conditions are so various, to arrive at the exact amount that must be added to or subtracted from the above figures to allow for this normal variation; but from an examination of many hundred cases it appears that prisoners sentenced to three months and under gain on an average about 0·02 lb. a day, so that the results under the first three heads must be increased, and under the fourth diminished, by this amount, to give the actual gains or losses due to the different forms of seclusion. In the first three cases it makes so small an alteration—the period being so limited—that it may be practically disregarded. In the fourth or off association class, it lessens the apparent daily increase to such an extent as to make it very doubtful whether simple seclusion in a cell for a limited period—say a month or under—exerts any material influence on the body weight. Of course I refer here simply to the weight, as other effects, both physical and mental, not unfrequently arise, which make it very important that these secluded cases should be very closely watched by the medical officer.

It is an interesting question with regard to the solitary cases, whether the loss in weight is due entirely to the lessening of the amount of food, or whether any, and, if so, what, proportion is brought about by any mental or nervous condition, acting either directly and interfering with the due appropriation of the bread taken, or indirectly in causing such a state of anorexia that even the limited diet allowed is not all eaten. That, apart from wilful abstainers, the latter is sometimes the case, is doubtless true; but it mostly occurs with those who have seen but little of prison life, and its rarity is indicated by the fact that in the present series of observations food was refused in only three cases. From these and other facts I have collected, I am inclined to the belief that in the "habitual criminal," as Dr. Nicholson uses the term,[1] the loss in weight

[1] 'Journal of Mental Science,' July 1873.

is entirely due to the deprivation of food. It is not my purpose to say anything here as to the mental effects of seclusion, but they vary, probably, in intensity in an inverse ratio to the frequency of the punishment. I have seen one hour's confinement in the dark cell, in the case of a young man convicted and punished for the first time, produce such a condition of fear and dread as to necessitate his immediate removal, the whole body being in a state of excessive tremor, and the sweat pouring off his face. With old hands, on the contrary, nothing of this sort is ever seen; in fact, some seem to hail the change rather as a relief from the monotony of their daily lives. I have notes of one incorrigibly idle man who persistently refused, in spite of repeated punishment, to perform his allotted task. He was sentenced to twelve months' imprisonment, and during his term he was punished no less than twenty-eight times, entailing seclusion for seventy-one days on bread and water, forty-eight of these being in solitary confinement, and twenty-three in the dark cell. I watched him carefully the whole time, but was unable to perceive that it had the slightest effect upon his bodily or mental condition; while, with respect to his weight, he left the prison 3 lb. heavier than he came in.

The prisoners were all females, and the observations extended over a period of eighteen months, but I have been unable to find any variation which might be regarded as being due either to the season of the year or to the age of the prisoner.

TABLE OF RESULTS.

Form of Punishment.	No. of Observations.	Average length of time under punishment in days.	No. losing weight.	No. gaining weight.	No. unaffected.	Net result in lbs. per day.	Allowing for normal increase, say 0·02 lb. per day.	Extremes in lbs. per day.	
								Loss.	Gain.
Dark Cell...	19	2·5	15	2	2	−0·85	−0·87	2·1	0·5
Half-light Cell ...	7	2·4	7	..	..	−1·11	−1·13	2·6	..
Solitary ...	72	1·8	66	3	3	−1·27	−1·29	3·0	2·0
Off Association ...	36	11·7	16	16	4	+0·04	+0·02	0·03	0·6

Critical Digests and Notices of Books.

On Infantile Paralysis and some Allied Diseases of the Spinal Cord—their Diagnosis and Treatment. By JULIUS ALTHAUS, M.D., M.R.C.P., Senior Physician to the Hospital for Epilepsy and Paralysis, Regent's Park. 8vo., pp. 56. Longmans & Co., London. 1878.

THIS monograph, to which the silver medal of the Medical Society of London was awarded on the 8th of March last, treats of a subject of considerable scientific and practical importance, with admirable succinctness and perspicuity. It brings into small compass, in a methodical manner, all that is known of the pathology of the anterior grey cornua of the cord; and by the firmness with which it differentiates its subject-matter,—drawing in what appertains to it, and pressing back what is extraneous,—it imparts somewhat of order and intelligibility to regions lying beyond its own immediate domain.

After a brief sketch of the normal and pathological histology of the spinal cord, and of recent experimental investigations into its functions in health and disease, in which justice is done to the labours of Pflüger, Goltz, Boll, Hayem, Lioville, Leyden, and Hamilton, Dr. Althaus proceeds to describe the symptoms of infantile paralysis. This disease may present itself suddenly, as paralysis in a limb or part of a limb of an apparently healthy child, but more frequently it is preceded by general malaise, and is ushered in by high fever, loss of appetite, pain in the head, and fits of eclampsia. After the eclampsia comes the paralysis, which reaches its maximum in a few hours and has no progressive character, and which may affect one or the whole four limbs and the muscles of the back

also. In this paralysis there is no affection of sensibility, which remains perfectly normal; no paralysis of the sphincters, which continue to act properly, and no decubitus. It is exclusively motor in character, and is followed by muscular atrophy, to which is frequently added contraction and deformity. When it is complete the muscles give no response to faradic electricity, the diminution of their excitability, as well as that of the nerves, beginning on the third or fourth day of the palsy, and continuing to increase until the end of the second week, when, as a rule, the excitability has altogether vanished. To voltaic electricity the muscular response gradually diminishes until the end of the first week, when it begins to rise, and ultimately becomes exalted beyond the normal standard. The paralysed muscles will then answer to ten or fifteen pairs of the battery, while the healthy muscles will respond only to twenty-five or thirty pairs. The normal response to the negative and positive pole is also altered, so that the cathode which generally predominates over the anode loses, and the anode gains in influence. At the end of a month there is a decided fall in the galvano-muscular response altogether. Ultimately any degree of voltaic power which it is possible to use produces no effect, or only a very slight one on making with the cathode.

Infantile paralysis is rarely fatal, so that post-mortem examinations have been unfrequent. The microscopical observations however of Cornil, Prevost, Vulpian, Lockart Clarke, Charcot, and others, leave no doubt that infantile paralysis is due to an extremely acute myelitis of moderate intensity, which is either diffuse or occurs in circumscribed areas, and affects more particularly the cervical and lumbar enlargements of the cord, the inflammation being generally confined to the anterior grey matter. In advanced cases the anterior cornua may be seen with the naked eye to be wasted, while their microscopical examination proves that their cells and fibres have been to a great extent replaced by connective tissue and amyloid corpuscles. Any cells that remain are shrunken and disintegrated. The peripheral nerves which have been paralysed are wasted, and the muscles are in a state of degenerative atrophy.

In the anterior myelitis of adults, which is comparatively rare, the symptoms, and their course and grouping, are almost identical with what is seen in infantile paralysis. In two striking cases which Dr. Althaus details, the apparent cause of the disease was a chill when the body was heated; but it seems probable, as he remarks, that there must have been at the moment of invasion a state of diminished resistance of the cord to external unfavourable influences. In the only distinct case of anterior myelitis in the adult which I have encountered, the disease came on in a clerk of sedentary habits, who had fatigued and heated himself inordinately by walking twenty miles on a bank holiday, and who sat for some time on the sill of an open window, on his return home, to cool himself, until, as he phrased it, he was "chilled in his loins." The etiology of this disease, however, as well as of infantile paralysis, is still exceedingly obscure. We can say definitely, however, that it is not of neurotic, syphilitic, or alcoholic origin.

The differential diagnosis of anterior myelitis is comparatively simple. From acute central or transverse myelitis, from hæmorrhage into the spinal cord, from spinal hemiplegia or hemiparaplegia, it is distinguished by the absence of anæsthesia, paralysis of the sphincters and decubitus, which characterises it. From progressive muscular atrophy it is marked off by the fact that the wasting of the muscular tissue in it does not precede the paralysis. From cerebral hemiplegia it is separated by the different commencement of the paralysis, by the non-involvement of the cerebral nerves, and by the loss of the farado-muscular excitability. With the palsy of obstetric operations, and with sclerosis of the lateral columns, it can scarcely be confounded.

Dr. Althaus shows that, in chronic spinal paralysis and in wasting palsy, the essential changes are in the anterior horns of the cord, and are similar to those found in anterior poliomyelitis.

As regards the prognosis and treatment of the group of diseases which he has so ably described, Dr. Althaus does not take a very favourable view. In the vast majority of cases he says there is ultimately partial paralysis with atrophy, deformity and contraction. "The results of treatment," he adds,

"have been somewhat discreditable to our art." The chronic form of polio-myelitis in adults is the only one that he seems to regard as at all amenable to treatment. Discarding the old and, until lately, approved regimen of calomel, cupping, leeches, and counter-irritation to the spine, he resorts, during the acute stage of polio-myelitis, alike in the infant and the adult, to the hypodermic injection of ergotine, which has been physiologically proved to contract the vessels of the spinal cord. By its action he hopes to avert the intense hyperæmia of the arterioles and small veins, and bursting of the capillary vessels in the cord, which are among the characteristic anatomical features of the disease. When the inflammation is over, he prescribes iodide of potassium, to induce absorption of exudations, to check excessive connective tissue growth, and so to allow those ganglionic cells which have not been entirely destroyed the possibility of regeneration. At the same time he insists upon the systematic use of the constant galvanic current, which should be made to pass through the diseased portion of the cord. Phosphorus and cod-liver oil may, he thinks, be beneficial, but he has not seen benefit accrue from the subcutaneous injection of strychnia.

But all these measures, however judiciously and patiently employed, yield but unsatisfactory results, and the truly appropriate and efficient treatment of anterior polio-myelitis remains to be discovered. Dr. Althaus has no hopeful anticipations to hold out, but I think we are fairly justified in looking forward to a largely-increased control over the morbid processes to which the anterior cornuæ are liable. The experiments of Feinberg point to methods of modifying the intravertebral circulation which may any day become valuable in treatment, and recent surgical observations indicate a power of regeneration in nerve tissue far greater than would have been conceived possible a short time ago. Then no doubt agents exist having a specialised action upon the great cells of the cord connected with the outgoing currents, and we must look to experiment for the revelation of these. At any rate, in a disease so disastrous in its consequences, and hitherto so little held in check, there can be no folding of the hands or resting

content with the existing weapons of attack, which are admitted to be so ineffectual.

J. CRICHTON-BROWNE.

Minds and Moods: Gossiping Papers on Mind, Management, and Morals. By J. MORTIMER GRANVILLE, M.D. Renshaw, London.

THIS little work, slight and unlaboured as it certainly is, scarcely deserves the title of gossiping, for the talk is far from frivolous, and the morality is sane, sensible, and wholesome. We have had some difficulty in following the imaginings, as in the first paper on Thoughtland, where the few northern travellers are described as very cold and comfortless. "Only a small tribe, resembling the Esquimaux, are being very much wrapped up in their own muddish surroundings; the two sexes scarcely discernible at a distance: frosty philosophers, with some more stable fluid instead of blood, ever registering an equable temperature—a terrible number of degrees below freezing-point." Wherever these may be, the author does not belong to them, but rather to the dwellers in "the temperate regions of Thoughtland—a recruiting ground open to intellects of all orders and capacities, with suitable entertainment for each."

In the paper on Dreamland, our author says that those "who work hard with their bodies by day, and need physical rest at night, seldom dream," &c. We are inclined to differ from this opinion, and we believe that sleep is never quite dreamless. Indeed, our author in his paper on Rest seems disposed to adopt this latter view, when he says, "Profound slumber may be dreamless, or the impressions received by the memory too faint to be recalled."

The author does not say point-blank, like Sir Thomas Browne, that we are responsible for our dreams; but he teaches the doctrine that nothing comes out of our minds which has not previously been admitted, for "what a man or a woman dreams is an indication of the elements which compose the bases of character."

Miraculous or prophetic dreams are trotted up to without shying by the author's "own sober roadster, common sense." Of them he says:—

"'Supernatural' dreams are either coincidences, the fruition of some latent thought that startled the dreamer when it happened to be defined in sleep, or the result of a process which physiologists call 'unconscious cerebration'—that is, the continuance of some process of thinking which goes on in the mind after the individual has forgotten that he set it in motion and supplied the impulse by his will. Most of the marvellous dreams which form the slender prop of decorated stories are of this nature. A suspicion, a fleeting thought passes through the mind that a calamity is about to happen. It is forgotten. The mind unconsciously works out the idea, and some stray impression, a momentary glance at some object, or the mere caprice of thought, brings it to the surface in a dream. The first idea, long past, was a shrewd conjecture—it is commonly among shrewd people that these dreams occur; the chapter of accidents—which is in truth a very methodical system of probabilities—explains the rest. It is much to be regretted that so many worthy and otherwise strong-minded people 'believe in dreams,' without troubling themselves to discover what these familiar but mysterious phenomena really are. Anything that gives men and women a plausible excuse for shaking off the obligations of personal responsibility is bad, and therefore injurious. Not even in sleep is the mind reduced to the position of subserviency. From first to last, waking and sleeping, our lives and experiences are what we make them."

In the paper on Cloudland, we think the author takes too sanguine a view of the curability of insanity when he says:—

"As a matter of simple fact, however, there can be no more mischievous impression than that what is called 'mental derangement,' pure and simple, may not be readily prevented, and cannot be *easily and safely cured*. In six cases out of ten insanity might be prevented at the outset if only there were a little more intelligence exhibited by those who are beginning to feel the tokens of a weakening power of self-control, which generally takes its rise in some moral delinquency unacknow-

ledged, perhaps unperceived. Eight out of every ten cases of actual insanity may be cured if taken at the very first outbreak of the malady."

There are no statistics of insanity which support this view even of the curability of the most recent cases; Thurnham, the most careful of statisticians, being decidedly opposed to it. Moreover, the condition upon which this curability is made to depend is an impossible one to realize; for how is a man who is beginning to feel the loss of self-control from insanity to exercise the intelligence demanded from him? It is before, and not after, the bounds of sanity have been transgressed, that a man exposed to insane influences may be successfully taught the rules of mental hygiene, as was long ago expounded in that brochure by Barlow, on the power of a man over himself to prevent insanity. Another objection, and a fatal one, is that not six cases out of ten of insanity, nor anything like that proportion, result from moral causes of any kind, much less from any moral delinquency.

The paper on Spiritland is spirited, and we quite agree with the author in his liking for a good old-fashioned ghost, and in his notion that "a firm belief in spirits is essential to a comfortable idea of Christmas. To conjure up a ghost for your use you must take Leonardo da Vinci's recipe to compose a battle-piece," and "stare at a smoked or daubed wall, until thought shapes the vision into a scene of headlong confusion of arms and men." Dr. Granville, however, would not, like Aladdin's evil genius, swop old lamps for new. He prefers crusted port, and lamps with the *verd antique*, and "the grand old ghost of half a century ago, who would have scorned such trivialities," as,—

"The modern mode of retailing spirits at *séances*—got up for the delectation of middle-aged persons of weak mind and prurient tastes—is not in any sense an improvement; spirits out of Spiritland like fish out of water, at the best panting and feeble spectres, with no thought or faculty above the thumping of table-legs and banging of tambourines, with perhaps a little slate-writing."

Our author is sound, though not profound, on the subject of Will, which indeed is a subject not well adapted for any paper

which can even be called gossiping. This term, which is more often used as a veil for ignorance than any other in the language, this abstruse *tertium quid*, this undiscovered element, this inconceivable residuum which divines use to explain sinfulness, legists to stamp the character of crime, and mental physicians to hide the insanity of their conceptions, Dr. Granville boldly declares to be desire. He would have hit the mark more in the midst if he had qualified his statement, the "Will is desire," by saying that will is a desire strong enough to produce effort; for much desire is, so to say, latent, and carved into no form of action, mental or physical, and therefore fails to conform to the notion we must entertain of what other people evidently intend to convey by the term. Our author says explicitly:—

"*Will is desire.* It springs from a longing to gratify some impulse. It works by determining the mental and physical forces to a particular end. It is amenable to all natural influences, stirred within, or operating from without. It is also capable of being so instructed and informed by education, knowledge, and experience as to be controlled in its action by considerations wholly intellectual. It retains the sceptre of self-government throughout life, unless consciousness is suspended or the mind becomes diseased. Except under these two last-named conditions, conduct is voluntary and admits no excuse. A weak will is, in other words, a wanton will, dallying with duty, and seeking a cover for wrong-doing in the pretence of being misled."

The paper on Self is thoughtful and thought-provoking. The line taken is the paramount importance of right self-culture. As Polonius says:—

> "This above all,—to thine own self be true,
> And it must follow, as the night the day,
> Thou canst not then be false to any man."

Or as that shortest and most piquant of proverbs, "Each one mend one," which, if obeyed, would soon wash most of the burrs and dirt from the face of society.

"Self-knowledge," says our author, "is the cardinal duty, self-respect the first guiding principle of life." Self-depreciation, if the investigation is carried far enough, ends with the

discovery of an abyss of corruption from which we turn away loathingly.

The humility gained by taking distorted and morbid views of self, like that acquired by gazing dreamily at the tokens and relics of human mortality, is neither useful nor ennobling. It never nerved a man for great deeds, or inspired him with really grand and elevating ideas. The true policy of self-knowledge is to look for the good in human nature; it is in this way that the natural safeguards of life and conduct will be strengthened, and a spirit of purity and goodness engendered by the rising principle of self-respect.

In the paper on Rest, we are disposed to question the doctrine laid down, that "its essential principle is *relief*,"—a term which only one partially agrees with, the notion of rest as cessation from motion. The relief of a spring means giving it freedom to act, which is the opposite of rest. Mental rest may indeed mean relief,—that is, removal from one train of thoughts to another, like the relief of a sentry; and it is quite true that mental rest is not otherwise attainable; but the author seems to have included too much within the meaning of his term, and especially when he not only makes it consist of relief but recuperation. The subject, however, is too wide to embark upon usefully on the present occasion.

From the concluding paper on the Burden of Life we quote the following vigorous passage:—

"It is, too, becoming a question of common sense, and one of no inconsiderable importance, whether some of our instructors are not pushing the pursuit of health and longevity to the verge of the ridiculous. If we are to be converted into a nation of valetudinarians, laid up in lavender, amid surroundings elaborately prepared to exclude disease and shut out death, and compelled to live under a 'rule' as irksome as that imposed on certain orders of ascetics, it will be time to ask if emigration to a less laboriously and exclusively healthful clime may not prove a relief from the toil of bearing a burden ruthlessly exaggerated. By all means rid civilized life of the parasites and creepers which have grown upon and surround it. Amend the errors and defects of great cities, reform and reconstruct the conditions of an existence carried on in such

breathless haste that there has been neither time nor strength to spend upon its own necessities; but let this good work be accomplished without crazing the world with total abstinence or any other totalism which tries to substitute sentiment for sense, and proceeds on the assumption that men and women must be treated as children, to be kept from everything that may be abused instead of being trained in its use. Obviously, for example, temperance is incompatible with teetotalism. No one can be temperate in the use of an article from which he is wholly debarred. It is a moral triumph to inculcate temperance, because the faculty of self-restraint is thereby developed and strengthened—and this faculty is the only trusty safeguard against excess of every and any kind. Meanwhile it is degrading to the intellect and character to enforce total abstinence. It is like putting gloves on a lunatic to prevent his injuring himself. It is not the way to elevate 'the people,' and it is time to speak out plainly on the subject of a craze which is working wondrous harm by enfeebling the national character it pretends to improve. The man who succeeds in using intelligently what he has hitherto abused has acquired a force of character which will serve him and advance his interests in many directions besides that of moderation in the recourse to stimulants; meanwhile self-government gives him a new aim in life, and the pursuit brings him happiness."

These desultory papers touch many subjects which interest us deeply, and we venture to hope that the outline of manly and wholesome thought traced in them will some day be filled up by the author with the care and labour which it so well deserves.

JOHN CHARLES BUCKNILL.

A Practical Introduction to Medical Electricity: with a Compendium of Electrical Treatment. (The latter translated from the French of DR. ONIMUS.) By A. DE WATTEVILLE, M.A., B.Sc. Lond.; Assistant Physician to the Hospital for Epilepsy and Paralysis; late Electro-therapeutical Assistant to University College Hospital.

THIS little book will, we believe, be of great use to many, and especially to those who, already knowing much of both elec-

trical science and of disease, have not yet been able to apply their knowledge of the one to their treatment of the other.

It deals successively with the "electric current," "apparatus," "electro-diagnosis," "electrization," and "treatment." The second chapter, that on "Apparatus," furnishes a very complete account of the various batteries and other implements, upon which the greatest reliance may be placed. It is well written, and fully illustrated by drawings. The third chapter, on "Electro-diagnosis," is practically useful, although not so complete in minute detail as that which we hope to see in a future edition. The fourth chapter, on "Electrization," contains very many valuable hints, and some acute criticism of the work done, or proposed, by other writers. With regard to the first and last chapters, we will speak hereafter.

The object of M. de Watteville appears to be, to give a more definite basis than that which has been hitherto given, in books on Medical Electricity, to the superstructures which have been raised thereon with regard to the ascertained facts of the behaviour of electrical currents; and, further, to supply minute and specific directions as to the mode of their appliance in the treatment of disease.

In respect of the latter, the medical application of electricity, the author has followed, as he states in both his title-page and preface, the writings of Dr. Onimus. He has, however, furnished, clearly, directions as to the form, force, and locality of such applications, and has enriched his book with copies of woodcuts, exhibiting very plainly the points to which the electric current should be applied in order to produce those special effects on individual nerves or muscles which are desired, but with regard to which a large amount of practical ignorance prevails. There is much in this section which we, from our own experience, should regard as somewhat romantic; but for this the author is less responsible than is Dr. Onimus.

The first chapter contains much valuable information; but we hope that in a second edition its author will endeavour to take for granted that many of his readers may know nothing, and will avoid the introduction of unexplained terms, and so expand his statements as to make his teaching thoroughly

intelligible to those who may have had no previous education on the subject. Great credit is due to M. de Watteville for the good style of English in which his book is generally written; but we are sure that so able a linguist as he is, will, by further revision, render its composition unexceptionable. We heartily commend the book to the careful study of those who are interested in electro-therapeutics.

J. Russell Reynolds.

Déjerine on Diphtheritic Paralysis.

In the 'Archives de Physiologie' for April, M. Déjerine gives an exhaustive account of researches made by him on lesions of the nervous system in diphtheritic paralysis. The five cases which were investigated occurred at the Children's Hospital of St. Eugénie in Paris.

M. Déjerine lays great stress on the experimental methods which he adopted. Of these there is only need to mention for further investigation the mode of examining the spinal nerves. They were placed in a one per cent. solution of osmic acid for twenty-six hours, afterwards washed with distilled water, treated with picrocarminate of ammonia and other staining fluids, and then teazed and mounted in glycerine. The main conclusions arrived at are the following:—

1. There exists in paralyses consecutive to diphtheria a lesion of the anterior roots; this lesion, analogous to that which is observed in the peripheric end of a cut nerve, is of an inflammatory nature.

2. This lesion was constant.

3. The alteration corresponded rigorously with the paralytic phenomena observed during life. In cases where the paralysis was confined to the upper limbs the alteration of the roots was not observed to extend beyond the first dorsal pair.

4. The degree of alteration was in direct proportion to the duration of the paralysis.

5. The posterior roots never presented any definite lesions.

6. Examination of the spinal cord seemed to demonstrate

that this alteration of the roots was secondary and consecutive to an alteration in the spinal cord.

7. This change in the spinal cord is probably inflammatory in nature; it is situated in the grey substance without affecting the white. It is slight in amount, and has no special localization to any group of cells.

The alteration in the anterior roots of the spinal nerves which M. Déjerine has so constantly found in these five cases must be accepted as a distinct addition to our knowledge, although Buhl had already described in one case swelling of the anterior and posterior roots, and of the intervertebral ganglia. M. Déjerine contends strongly for the central origin of the change in the spinal nerves. According to his view, there is a slight myelitis affecting especially the anterior horns, for the change in the anterior roots is secondary to this myelitis.

With the exception of the first case, where it is reported as healthy, there is no note of any examination of the medulla oblongata, and there is no record at all of the histological characters of the nervous and muscular structures of the soft palate, although in every case there was paralysis in that region. In the absence of negative experimental evidence on this point, we cannot consider that M. Déjerine has demolished the view urged by Leyden and others, that an ascending neuritis is in many cases the cause of the nervous disturbances subsequent to diphtheria. It is certainly of great significance that paralysis, even when generalized, in the vast majority of cases, begins with affection of the soft palate. It is not at all an uncommon experience that a child may have had a diphtheria not sufficient to keep him confined to the house for more than a week; but succeeded within three weeks by altered speech, regurgitation of fluids through the nose, defective accommodation, and some ocular palsy, without any other paralytic condition at all.

In the absence of anatomical proof, which is the more likely hypothesis, that these conditions result from a central lesion (to which we presume M. Déjerine's views would tend), or from an inflammation of the muscular substance of the palate, inducing a neuritis of some of the branches of the pharyngeal

plexus and an extension by means of the carotid plexus to the lenticular ganglion?

From the clinical varieties observed, there seems the strongest reason to believe that this inflammatory condition is sometimes a neuritis only, whilst in other cases it extends upwards to the bulb, and down certain tracts of the cord.

There is a strong presumption for the reasonableness of this view in the analogy of the so-called reflex paraplegias occurring subsequently to dysenteric and vesical ulcerations. It cannot be too plainly stated that the anatomical proof of an ascending neuritis being the *modus operandi* in these cases, is still incomplete. We are only concerned at present to point out that M. Déjerine in his experimental researches has not disproved it.

It is quite possible that in grave diphtheria, as in many infective diseases, there may be vascular and other changes of the nervous tissues, occurring as part of the general infection —and along with these the myelitis and disease of the anterior roots observed by M. Déjerine doubtless find a fitting place; but if the clinical history of the milder cases means anything at all, the phenomena observed must arise in quite a different way.

M. Déjerine contends strongly against the specificity of diphtheritic paralysis, and would put it in the same group with the cases of paralysis after typhoid, typhus, and small-pox.

It appears to us that this classification should be accepted with reserve, for some of the nervous lesions observed after the acute specific diseases are undoubtedly embolic in origin.

That a paralysis beginning at the soft palate and becoming more or less generalized is not *indubitably* diphtheritic is proved by Senator's important case, where such a condition followed on abscess of the tonsil; but seeing that in the multitude of palato-pharyngeal inflammations this form of paralysis is excessively rare except after diphtheria, it may be taken as sufficiently characteristic for practical purposes. Senator's case is quite in accord with the doctrine of a neuritis migrans.

T. Barlow.

Munk on Localization of Function in the Brain. 'Weitere Mittheilungen zur Physiologie der Grosshirnrinde.' Verhandl. der Physiolog. Gesellsch. zu Berlin, Nos. 9 and 10. April 12, 1878.

In a communication to the Physiological Society of Berlin, on March 23, 1877, Herr Hermann Munk announced that he had discovered that in dogs the brain was divided into a sensory and motor region by the fissure of Sylvius, and that destructive lesions of certain parts of the cortex caused loss of sight and of hearing respectively. The figures which accompany the present communication enable us to see where he localizes the visual and auditory centres—this being impossible in his first communication, as the references were not illustrated. The former is situated at the posterior part of the second external convolution, and the latter at the posterior and lower extremity of the third external convolution.

The lesions will be seen to involve the regions in which I have localized the visual and auditory centres in this animal (see fig. 32, 13 and 14, p. 149, and §§ 65 and 66, 'Functions of the Brain').

Herr Munk did not allude, adversely or otherwise, to my results in his first communication; but being "aufgefordert" to do so, he added an appendix, in which he effectually disposed of them with a contemptuous epithet and a point of exclamation; and he says in his present paper that he did not think it necessary to mention my 'Einschlägigen Untersuchungen' in the first instance, "because he had nothing good to say of them."

Having localized the visual centre in the dog near the posterior extremity of the hemisphere, and apparently regarding the occipital lobe in the monkey as homologous therewith, he came to the conclusion, before having made experiments on the subject, that the visual centre in the monkey was situated in the occipital lobe.

After making some experiments, he has succeeded in convincing himself that when the whole of the convexity of the occipital lobe in the monkey is destroyed, the animal becomes

hemiopic; and that when both lobes are similarly destroyed, the animal becomes completely blind.

He disposes of my results on the ground that the observations were made before the general constitutional depression consequent on the operative procedure had passed off, but with considerable *naïveté* comments on the same page on the remarkable absence of constitutional disturbance in the monkey after cerebral lesions, stating, though the remark is not quite original, that "the monkey, even after twenty-four to thirty-six hours, appears free from fever, and as well as before" (p. 41).

Assuredly, if conclusions as to the cause of derangement of special functions were to be drawn from observations made during a state of general constitutional perturbation, they might be objected to with justice.

But if it should happen that, after destruction of a certain part of the brain (whether constitutional depression existed or not), a certain function should show no signs of impairment or derangement, we should have a very conclusive proof that the part destroyed had no relation to this function; and there would be very substantial grounds for attributing any derangement which might occur subsequently to secondary changes, and the extension of the lesion to centres not actually injured in the first instance. I have drawn attention to these sources of fallacy, and, keeping them in view, endeavoured in my researches to carry out exact observations, and compare the phenomena with the experimental lesions before such complications could arise. I have specially called attention to the danger of interfering with the true visual centre—the angular gyrus—when the experimental lesions in the occipital lobe trench too closely on the parieto-occipital fissure, and have found, on careful post-mortem examination, that in all cases in which vision was impaired in connection with lesions established primarily in the occipital lobe, the angular gyrus was more or less affected. Herr Munk does not appear to have paid any attention to such precautions, or to have actually tested the results of lesions accurately limited to the angular gyrus.

In Experiment 22, Phil. Trans., 1875, vol. ii. p. 478, the

following note occurs of an observation made on a monkey in which both occipital lobes had been thoroughly broken up, as indicated in the accompanying figures (figs. 29, 30, 31) :—

"5.45 P.M. [an hour and a quarter after completion of the operation].—Gives emphatic evidence of sight. Ran away when I approached it, carefully avoiding obstacles. Seeing its cage-door open, it entered and mounted on its perch, carefully avoiding the cat which had taken up its quarters there. Tried to escape my hand when I offered to lay hold of it, but picked up a raisin which I had left on the perch."

Herr Munk may possibly be able to explain how these things could be done by an animal in a general state of constitutional depression and deprived of sight; but if an animal can act to such purpose after removal of its visual centres, it would appear to find little use for them.

Herr Munk further finds the "Fühlsphäre," or region of tactile and common sensation, in that part of the brain of the dog usually termed motor; and he announces that in the monkey it is situated immediately anterior to his visual centre: but whether he has actually found it, or is only going to do so, is not quite clear.

In his facts and inferences on this point he adds little or nothing to what has already been stated by Schiff, and conclusively refuted by the best of all evidence on this head, viz. clinical and pathological observation.

The question of cerebral localization remains much in the same position as it was before Herr Munk began his valuable researches.

D. FERRIER.

The Nature and Treatment of Rabies or Hydrophobia. Being the Report of a Special Commission appointed by the 'Medical Press and Circular.'

THIS volume is the result of the investigations of a special commission appointed to inquire into a subject which has recently been prominently before the public, and widely discussed in both lay and medical journals, "assuming the

aspect of a question so important as to agitate the country from end to end, disturb the very relations of life, and excite suspicion and distrust of our poor four-footed friend the dog."

It may be questioned whether the discussion of such subjects in ordinary journals is expedient, tending, as it must, to excite the imagination, arouse morbid expectancy, and thus predispose the nervous, timid, and excitable to suffer from a disease which, whatever may be its true origin, is doubtless one of a character to be intensified and exaggerated by strong mental impressions. There cannot be, however, any doubt that the subject is one essentially appropriate to medical periodicals, and the report in question affords ample evidence of the value of such discussions, for it has brought together, in a clear, lucid, and succinct manner, all that past and present knowledge has to say in regard to the history, etiology, pathology, and treatment of this very interesting and obscure disease.

It shows not only how much, or how little, we know, but it indicates the direction in which we may look for more light; and, whilst admitting freely that the subject is one of much obscurity and difficulty, it still takes a more cheerful view than that generally hitherto held, and declines to superscribe the portal of the hydrophobic sufferer with the gloomy words,

"Lasciate ogni speranza voi che entrate;"

rightly refusing to admit that, because treatment in the past may have been so often irrational and unscientific, there are necessarily special conditions in rabies to preclude the hope that advancing science in the present day may enable us at last to grapple successfully with this as it has done with other difficulties erewhile regarded as insurmountable, and declaring that the word "despair" should be erased from our vocabulary: for, having certified cases of recovery on record, we may reasonably look for still further conquests over the disease, and anticipate that rabies "will ultimately be controlled with as much certainty as dilatation of the pupil is produced by atropine, or its contraction by Calabar bean." Whether it prove to be so or not, this is at all events a hopeful

view of the matter, and rightly expresses the spirit in which we should pursue our investigations of what is, after all, but one of the manifold affections to which humanity is liable, and, dismissing all prejudices and old traditions, go on anxiously seeking all the information we can acquire respecting the conditions under which the disease is developed—its pathology and the means by which it may be prevented or controlled; and that by thus gradually unravelling the secrets of Nature, Science may at length achieve further legitimate triumphs.

The report is divided into fifteen chapters, each of which is full of interest, dealing with the statistics of the disease in past times, and noting the conclusions arising therefrom. The morbid anatomy and pathology, etiology, symptomatology, the period of incubation, frequency, and mode of transmission; the treatment, curative, preservative, and preventive; the curiosities of treatment and of its literature, are all fully considered. A synopsis of rabies in animals, an historical and bibliographical account of the disease and its geographical distribution, are given; whilst the two last chapters are devoted to a chronological table of authorities since 1870, and a complete bibliography chronologically arranged. Space will only admit of a few remarks on some of the more important points discussed in this very complete and interesting monograph.

It begins by pointing out that the problem of the nature of hydrophobia has yet to be solved, the period of incubation has to be accurately defined, the exact part of the organism affected to be clearly demonstrated, and the remedy yet to be submitted to the test of further experience before we can pronounce on its powers. It observes how essential it is that facts should be accurately noted, and their true nature critically determined; for neglect of this has caused cases to be reported as rabies that were really due to other pathological states, such as tetanus, acute mania, and certain forms of cardiac disease: some instances are cited in proof of this, whilst others show that nervous influence and powerful mental emotion may originate mistaken diagnoses. Certain questions, it is suggested, demand examination:—

Can hydrophobia arise spontaneously in the lower animals?

Is it communicated only by animals who use their teeth as weapons of defence?

Does it arise spontaneously in the human species?

Can it be communicated from one human being to another, or by the human species to other animals?

Are there any facts showing the poison may be introduced without a bite?

Is the evidence of Girard and others who deny the existence of a poison satisfactory?

And, as far as our present knowledge admits, replies are furnished to these queries.

Statistics afford evidence that it does not follow as a matter of course that hydrophobia will invariably develop from the bite of a mad dog. Just as the poisons of cholera, typhoid, and diphtheria do not affect certain organisms, so the poison of a rabid animal seems inert in some cases; and, considering the number of persons bitten in Great Britain yearly, it affords some consolation that the proportion of real cases of rabies is comparatively few. The knowledge of this should soothe the public mind, which becomes needlessly alarmed by reading and hearing sensational accounts of the disease.

An analysis of 150 cases of so-called hydrophobia gives 103 deaths, all from true rabies; 10 genuine, and 12 questionable recoveries—*i.e.*, in the latter the cases were not proved to be real rabies. There were 17 cases illustrative of the spurious or imitative form, and 8 in which the evidence of their real character remained doubtful.

If we separate the spurious and doubtful, we have 103 genuine cases of the disease remaining, of which there were 10 genuine recoveries under various kinds of treatment: 1. Salines, aperients, blisters; 2. Mercurials and excision; 3. Mercury; 4. Iodine; 5. Cautery, vinegar, genista lutea; 6. Calomel; 7. Cautery, Indian hemp, chloroform, morphia; 8. Cautery; 9. Morphia, chloroform, curara; 10. Curara. Ten recoveries out of 113 cases of genuine hydrophobia is a better result than is generally supposed to attend that disease, and gives hopeful assurance that we may look for better still, when

increased experience and further investigation shall have thrown clearer light on its etiology and pathology, and on the nature of the virus.

Without questioning the efficacy of treatment in the 113 cited cases, it may be permitted to suggest that possibly recovery may have been due in some of them to the smallness of the dose of the virus inoculated, to the natural vigour and strength, and to activity of the eliminative processes in the patients. There is no poison, however active, of which there is not some quantity that is not necessarily fatal. Such is the case in the colubrine and viperine virus; and it may be so in respect of rabies as of snake poison, and that recovery is due to this cause rather than to the effect of remedies, which for the most part are, as antidotes, totally inert. It may not, however, be denied that in some cases careful medical treatment, and its important adjunct, good nursing, may determine the saving of life that otherwise would have been lost.

Statistics show further, that under the head of hydrophobia certain cases are apt to be included that have no relation whatever to the specific disease produced by the bite of a rabid animal; as also, that nearly every form of treatment suggested by empiricism, superstition, and reason, has from time to time been employed.

It cannot be disputed that there is such a specific disease depending on a special poison, attended by the most distressing symptoms; difficulty of swallowing, rather than horror of water (which is really not always present), being one of the most marked phenomena. There have been, indeed, perhaps still are, authorities who attribute the entire train of phenomena to a perverted condition of the nervous system; but the evidence, on the whole, and especially as it relates to young children, dismisses the idea of its being due to an imaginary or nervous origin solely.

Rabies certainly is a specific disease communicated by a rabid animal, generally, though not invariably, of the canine family, and it is as definite and marked in its characteristics as tetanus, whooping-cough, or any other well-known malady. It is equally sure that this is not produced by the bite of a healthy animal, and that only a limited proportion of persons inocu-

lated are capable of developing the disease: in this it resembles many other diseases, while it differs from snake poisoning; for, so far as we know of the latter, though there may be degrees of toleration, there is not absolute immunity for any one.

A distinct affection of a nervous character, due to derangement in the motor centres, simulating hydrophobia, also occurs, and may prove fatal. There are, moreover, certain forms of heart disease and pericarditis in which similar symptoms are said to be produced, and, in illustration of these conditions, cases are adduced. It is since 1829 that we find the first foreshadowing of some rational explanation of the phenomena; and to Dr. Clifford Allbutt and Mr. Fleming, more recently, we are indebted for the first starting-point of a more advanced stage in the history of the pathology of rabies. The importance of accurate diagnosis, and the difficulties in its way, are set forth, and it is suggested that with the view of insuring more certain information, the powers of the medical department of the Privy Council might well be extended, and that as zymotic diseases come under their supervision, so should rabies; and thus, additional aid in noting, and scientifically observing and treating cases, wherever and whenever they occur, might be afforded with benefit to the public and the profession alike.

In regard to treatment by curara, a remedy itself so dangerous, its use under great caution and restriction is justifiable, and may be left to the discretion of medical men generally, for there is no reason to suppose that they would recklessly use so potent an agent. At the same time the strange anomaly presents itself of the physician being permitted to use on man himself that which he is prevented—unless he be a licensed experimenter—from using tentatively, for the benefit of the human species, on the lower animals.

The section devoted to the morbid anatomy and pathology is very interesting; it relates all the views that have been held from past times up to the investigations and discoveries of the present day. The phenomena and symptoms are declared to be due to the influence of a morbid poison, whose malignant influence is directed to the nerve-centres, but chiefly to the medulla oblongata. The morbid appearances in

the spinal cord and medulla, described by Allbutt, Coates, Benedek, Gowers, and others, are detailed: these are said to consist mainly of changes in the nerve-cells and vessels; and the presence of round cells, and leucocytes in the perivascular spaces, in the nerve tissues itself, and among the nerve elements, in granular degeneration and even embolism; such changes being most marked about the respiratory centres.

These anatomical investigations are of great value, but they are not conclusive: they tell of changes that have taken place, but they throw little light on the essential nature of the disease itself, and it is not impossible that similar changes may result from other diseases; but still they are important discoveries in relation to the pathology of hydrophobia. As regards the character of the virus, the long periods of incubation that often intervene between the bite and its consequence, and what happens to it during the delay, all is yet uncertain and conjectural. The true import of the so-called lyssi, whose very existence has been denied, is still unknown to us. The pathological changes in the centres already referred to show why certain phenomena were manifested, but nothing as yet explains how the poison has so acted.

The summary of our knowledge would seem to be "that the phenomena of rabies depend on structural changes in the medulla oblongata and spinal cord, influenced by a specific virus" originating in the lower animals, but the *modus operandi* of which is yet involved in obscurity. The important subject of treatment—preservative, curative, and preventive—is fully considered. The great object is to prevent the entry of the virus into the circulation, for which purpose ligature, cautery, and excision are effective; and as we have no positive evidence as to the localization, or its duration there, of the poison, we are not to despair of success, should the bitten part not be so dealt with until some time after the wound has been inflicted, even so late as when it has actually cicatrized—though, of course, the earlier the better. Suction, it is observed, is not necessarily dangerous, unless the lips be abraded, as any virus taken into the mouth is at once ejected with the saliva, and the danger reduced to a minimum, as the

danger of absorption under these circumstances is infinitely small.

Local applications of cautery and cupping are recommended for similar reasons.

The old plan of excising the bitten parts, by cutting round a plug of wood inserted into each bite, is good, especially if done early. It has the advantage of adding to its intrinsic merits, that of giving confidence in the assurance that the cause of danger has been thoroughly removed.

Various forms of general treatment are described; they have met with comparatively little success, except as euthanasia. The value of curara as a remedy is still *sub judice*, and needs further inquiry. So deadly a drug must needs be employed with great caution; in a disease so desperate, however, the most extreme measures, provided they offer any reasonable prospect, on scientific grounds, of success, are justifiable, and should be employed. It may be that further experience of this agent, perhaps combined with artificial respiration, will yield satisfactory results. It would be more satisfactory if its action could be tested on the lower animals; this, however, is now impossible; so man must wait rather than they should suffer.

The various methods of treatment, such as with chloral, chloroform, and other narcotics and sedatives, and indeed all measures, whether curative, preservative, or preventive, are fully discussed.

The importance of preventive measures is insisted on, and the methods of effecting them pointed out. Suggestions as to how the canine species is to be dealt with in regard to his own and his master's welfare are made.

The volume concludes with an interesting chapter on the curiosities of treatment, and of its literature, which, like those that precede it, is full of interest, and will well repay perusal.

The Report is altogether a most valuable one, and will, as its authors say, form a *point d'appui* for future workers, and will stimulate further scientific inquiry into the nature of the disease. Such investigation is entrusted to competent hands; and from those of Burdon-Sanderson, Brunton, and Callender

"we may well look for more complete elucidation of its difficulties with hope and confidence."

JOSEPH FAYRER.

Cyon on the Functions of the Semicircular Canals. 'Recherches expérimentales sur les Fonctions des Canaux semi-circulaires.' Thèse pour le Doctorat en Médecine, par Élie de Cyon. Paris, 1878. 4to. p. 106.

IN his graduation thesis at the University of Paris, M. Cyon, the distinguished physiologist, formerly of St. Petersburg, discusses the functions of the semicircular canals, a subject to which he has devoted special attention, and on which he has published several valuable memoirs, the first of which appeared in Pflüger's *Archiv für Physiologie*, in 1873. Since his first researches the important observations of Mach, Crum-Brown, and Breuer, and others have appeared, and M. Cyon now reviews the whole literature of the subject, and adds many new experiments. He modifies in several particulars his former views, and comes to somewhat novel conclusions as to the functions of the semicircular canals in the formation of our notions of space.

As is well known, the experiments of Flourens on the semicircular canals form the starting-point of all researches in this direction. To explain the results first described by Flourens, and to interpret the vertiginous disorders such as have been described by Purkinje when the body is turned for some time on its longitudinal axis, and similar phenomena, is the main object of M. Cyon's dissertation.

His first series of experiments led our author to the following conclusions:—

"(1). To preserve the equilibrium of the body it is necessary to have a correct notion of our position in space.

"(2). The functions of the semicircular canals consist in furnishing us, by means of 'unconscious sensations' (*sensations inconscientes*), with a correct representation of this position. Each canal has a determinate relation to each of the three dimensions of space.

"(3). The motor disorders which result from section of the semicircular canals are divisible into three groups:—

"(*a*). Disorders of equilibrium as the direct result of the section.

"(*b*). Involuntary movements excited by abnormal sensations (auditory?).

"(*c*). Secondary phenomena occurring several days after the operation, and due to irritation of the cerebellum, &c."

Böttcher has attempted to show that all the results supposed to be due to section of the semicircular canals are in reality due to injury of the cerebellum during the operative procedure. M. Cyon disposes of this view very successfully, urging, among other arguments, that injury to the cerebellum (though no proof of such can be given), even if it did exist, would cause always the same phenomena; whereas the character of the phenomena depends entirely on the canal which is divided. Mach, Crum-Brown, and Breuer have attributed to the semicircular canals the origin of the impressions of acceleration of movement, or sense of rotation which is experienced when the body is rotated on a revolving disc:—impressions which are conditioned by the movement of the endolymph, in the reverse direction to that of the rotation of the body, causing irritation of the ampullary nerves. Purkinje's vertigo they account for by the conditions so established in the semicircular canals. Breuer in criticising M. Cyon's views considers that he advocates views little, if at all, differing from those clearly put forward by Goltz, viz. that the semicircular canals by virtue of relative differences of tension in the ampullæ are the source of impressions necessary for the due co-ordination of the movements concerned in the maintenance of the equilibrium of the head, and, through it, of the whole body. Cyon objects to this representation of his views, and endeavours to make out points of capital difference between himself and Goltz. He repudiates, above all things, being regarded as in any way holding that there are either central or peripheral organs devoted exclusively to the function of co-ordination of movements.

Though abnormal positions of the head may produce pheno-

mena almost exactly like those caused by section of the semicircular canals, it is only indirectly that they do so, and the phenomena may occur without any changes in the position of the head.

The cause of the motor disorders must therefore be otherwise explained.

Taking up the views of Mach, Crum-Brown, and Breuer, respecting the movement of the endolymph, Cyon urges several theoretical and anatomical objections, and brings forward a series of experiments in which, by exposing the canals and varying the pressure in them, evacuating them, fixing them, &c., he shows that none of the phenomena described by Flourens result; and that therefore the excitant of the ampullary nerves does not consist of varying degrees of pressure exerted by the endolymph. He refuses to attribute Purkinje's vertigo to the condition of the semicircular canals after rotation, and agrees with Purkinje himself that it is due to mechanical disturbance of the brain. How this causes vertigo, however, he does not further explain. Breuer had found that if the auditory nerves were cut on both sides in a pigeon, vertigo was not caused when the animal was rotated, but Cyon denies this, stating that apparently the same motor disorders occur as in the normal animal.

Proceeding to his recent experiments on the canals, Cyon calls attention specially to the fact of the *diversity of the movements* according to the canal which is divided.

His results agree in the main with those of Flourens as regards pigeons. These may be comprehensively generalized as follows: "Section of the two symmetrical canals causes oscillations of the head in the same plane as the canals."

The movements of the body follow those of the head, though they are more difficult to analyse, the animal turning somersaults head over heels, or the reverse, making movements of *manége*, &c. When all six canals are divided in the same animal, the motor disturbances are irresistible and indescribable. The animal dashes itself everywhere, and requires to be enveloped in a cloth to prevent fatal injuries. This state continues for three or four days, after which the animal may be set

free, but the motor disorders continue for from ten to fifteen days on the slightest attempt at change of position.

After this it seems gradually to learn to maintain its equilibrium by the aid of its other senses, chiefly sight. By the end of several months it acquires a considerable degree of stability, but it can never again fly, and the disorders always tend to occur when the animal is disturbed. It generally seeks a dark corner and remains still. When the canals only of the one side have been destroyed, the disturbances are less pronounced, and disappear much sooner. Hence, Cyon argues, the theory of Crum-Brown respecting the relations subsisting between the canals of opposite sides, *e.g.* the superior vertical forming one system with the posterior vertical of the opposite side, cannot be maintained.

Among other phenomena Cyon observed that after section of the canals on one, or both sides, but not symmetrical, the animal's leg would occasionally suddenly give way, and double up as if it had been broken. This giving way of the leg, like that seen in ataxics, generally occurred on the side of lesion, or, if the canals were injured on both sides, on the side on which the greater injury was inflicted. It particularly occurred when the vertical canal was injured.

Attempts were made to ascertain the effect of electrical irritation of the individual canals; but, owing to the difficulty of localizing this mode of irritation, little reliance can be placed on it. The principal result observed was a sudden deviation of the head away from the side irritated.

The results of section of the semicircular canals in rabbits differ in several important respects from those occurring in pigeons. The differences are principally:—

(1) The motor disturbances are very violent, and of long duration in rabbits, even if only one canal is operated on.

(2) The disorders are especially pronounced in the movements of the eyeballs, less so in the trunk, and are scarcely perceptible in the head.

The movements of the eyeballs are independent of those of the head, and Flourens was wrong in asserting that they ceased when the head was kept still. The direction of the movements depends on the canal which is irritated. As

regards the direction of the movements, Cyon modifies somewhat his statements in the memoir which he presented to the Académie des Sciences, in 1876.

He finds that excitation of the horizontal canal causes movement of the eyeball forwards and downwards; of the posterior vertical, backwards and upwards; of the anterior or superior vertical, backwards and downwards. This refers to the eyeball on the same side. The eye of the opposite side moves in a reverse direction, viz. backwards and downwards, forwards and downwards, forwards and upwards, respectively.

In his former experiments he found also that the pupil of the same side became contracted, the opposite remaining dilated. He finds now that this is not constant, and that frequently both pupils are dilated, but always most on the opposite side.

It is very difficult, on account of the position of the eyes in the rabbit, to reduce the various forms of nystagmus observed to their homologues in human pathology. Cyon proposes to work this out subsequently.

At the time M. Cyon formed his first hypothesis respecting the functions of the semicircular canals and their relation to ideas of space, he had not ascertained their relations to movements of the eyeballs. A consideration of these phenomena in their relation to each other led him to formulate certain definite conclusions as to the origin of our notion of space: "Granted that our notions of the disposition of objects in space depend especially on unconscious sensations connected with the innervation or contraction of the ocular muscles, and that each excitation, however slight, of the semicircular canals causes innervation and contraction of the same muscles; it is certain that the centres of the nerves which distribute themselves in the canals are in intimate physiological relation with the oculo-motor centre, and that consequently this irritation intervenes in a determinate manner in the formation of our notions of space" (p. 63).

This conclusion, he says, is only a restatement of the facts above related. Formulating his views with greater precision, he says, "The semicircular canals are the peripheral organs of the sense of space (*sens de l'espace*); that is to say, the sensations provoked by excitation of the nerve terminations in

the ampullæ serve to form our notions of the three dimensions of space. The sensations of each canal correspond to one of these dimensions. By the aid of these sensations we make a representation in our brain of an ideal space to which we refer all the perceptions of our other senses concerning the disposition of objects around us, and the position of our body among these objects" (p. 64).

Our author then proceeds to discuss and criticise the intuitional and empirical theories respecting the origin of our ideas of space. Discarding the intuitional view, he thinks that the ordinarily accepted empirical view which derives our notion of space from muscular sensations combined with local signs, is defective, and that this defect is made good by the discovery of a peripheral organ having for its function the origination of unconscious sensations corresponding to each of the three dimensions of space.

Starting from this basis, M. Cyon proceeds to analyse the phenomena of visual vertigo. It is known that after rotation of the body for some time on a longitudinal axis, as in waltzing, "a vertiginous sensation is experienced, in which all space seems to us to turn in another imaginary space, in a direction opposite to the movement of our body. The explanation," M. Cyon says, "is easy to find. Whatever be the nature of the troubles caused by the rotation of our body, it is evident that once the normal relations subsisting between the impressions derived from our eyes and those from our semicircular canals are deranged, there must result a temporary impossibility of harmonizing space seen, with the ideal space constantly present to our mind" (p. 75).

He comments on a curious fact noted by Mach, which Mach considered peculiar to himself, but which, it appears, is not so, viz. that when, during the rotation of the body, a phosphene is made by pressure on the eyeball, and the eye kept immovable, the phosphene also appears to rotate. The rotation of the phosphene, therefore, must have an origin quite apart from displacement of the retina, which is kept still. Mach accounted for this as follows, "that the optical space is projected into another space, which we construct by means of our muscular sensations." Cyon would say "sensation of exten-

sion" or "direction," instead of "muscular sensations." He states that movements of the eyeballs occur in him only if the rotation is slow, whereas in rapid rotation the eyeballs remain at rest. If during this a phosphene is made, it moves while the body whirls, and on sudden cessation the phosphene continues the movement for an instant, and then executes a movement in the reverse direction before ceasing altogether.

Contrary to the views of several authors, who state that visual vertigo becomes less, if it does not entirely disappear when the eye is suddenly fixed on a near object, Cyon finds that the vertigo is augmented by this procedure, so much so, in his own case, as occasionally to cause nausea and even vomiting. He is obliged, when he fixes his eyes, to sit down, otherwise he would fall. Visual vertigo, he says, may occur therefore with the eyeballs quite motionless and fixed. One might attribute the movement of the phosphene in Mach's experiment to sensations of innervation, even though this should not actually result in movement of the eyes. Mach rejects this explanation, which Cyon, however, regards as the only satisfactory one. But this does not suffice to account for the other fact that the phosphenes still move, when, instead of adopting the uncertain method of fixing the eye by the finger, we fix the eyes on a near object. Here it is evident that the sensations of innervation can only indicate fixation of the eyeballs. Hence, if the phosphene continues to move, it is clear that visual vertigo may occur altogether apart from the oculo-muscular apparatus, and therefore must be purely psychical in its origin.

This is the view which was first enunciated by Zöllner, in reference to the phenomena of M. Plateau and M. Oppel, and pseudoscopy.

Other considerations militate against the theory generally held respecting ocular vertigo, viz. that it depends on ocular movements unaccompanied by sensations of muscular innervation, and hence the movement of retinal images is projected outwards.

This explanation may suffice for ocular vertigo at the moment of its appearance, but the vertigo ought to disappear

as soon as the sensations of muscular contraction come to correct the illusion. Thus, after a time, those suffering from chronic nystagmus cease to experience any vertigo. And, in fact, there are conditions in which movements of the eyeballs may diminish, and others in which they increase the vertigo. In alcoholic intoxication the vertigo is increased by closure of the eyes, whereas in sea-sickness closure of the eyes diminishes it. In the one case external objects are fixed, and hence the muscular innervation of fixation of the eyes acts as a corrective to the vertigo, whereas in sea-sickness everything is in motion, and the brain is also subject to mechanical disturbance.

All the instances of illusory movements can be reduced to a dis-harmony between our perception and our ideal representation of space. Given the three co-ordinates representing the three dimensions of space, illusory movements will appear, whether the objects change their relation to the co-ordinates, or the system of co-ordinates alter their relation to the objects.

It was remarked that pigeons, after section of the semicircular canals, preferred always to remain in a dark corner. This our author accounts for by supposing that the animals, thinking that the cause of their trouble is in the eye, seek obscurity to get rid of it.

Another fact which he quotes as showing that the motor disorders following section of the canals are due to disharmony between space seen and ideal space, is that pigeons which have been operated on preserve their equilibrium only when the head is kept in the most strange and abnormal positions. Thus, when the posterior vertical canal is cut, the pigeon rests with its head completely reversed, the occiput being held downwards, the left eye looking right, and the right left. A restoration to the normal position causes a recurrence of the motor disorders. It is to be concluded that, with the head so placed, the animal succeeds in harmonizing its visual and ideal representation of space. The position of the head is important as regards the maintenance of equilibrium, but Cyon, following Goltz, at first attached more importance to it than he now thinks it really has. In fact, all the motor disorders in pigeons may occur without any move-

ments of the head; and in rabbits, as has been seen, the eyeballs are especially affected. Oscillations of the head only augment, but are not the essential cause of the disorders. The motor disorders affect those movements principally which are chiefly employed by the animal in its orientation in space. Hence in the pigeon they are seen in the head, because the oculo-muscular apparatus here plays only a secondary part; in rabbits they occur chiefly in the eyeballs, while in frogs they affect principally the movements of the trunk, the head in their case possessing little mobility.

Summing up his views as to the phenomena consequent on section of the semicircular canals, our author says they are due, "(1) to a visual vertigo caused by the dis-harmony between space seen and ideal space; (2) to false notions resulting therefrom as to the position of the body in space; (3) to disorders in the distribution and graduation of the innervation of the muscles" (p. 91).

Regarding it as established that the semicircular canals are the peripheral organs of the sense of space, it is natural to ask, what is the normal excitant of the sensations? This Cyon considers a difficult point, but regards the views of Goltz and of Mach as disproved. He is inclined to attribute the excitations to vibrations of the otolithes, and perhaps of the epithelial cells which are connected with the peripheral endings of the vestibular nerves. As the sensations are "unconscious," it is naturally impossible to speak with absolute certainty on the subject. But, whatever may be the exact mode of excitation, it is certain, he says, that the canals are the origin of sensations in three planes perpendicular to each other, and that these unconscious sensations serve as the basis of our representation of the three dimensions of space.

As regards the relations, if any, of the semicircular canals to the sense of hearing, Cyon objects to Flourens' conclusions which assumed that section of the canals meant their paralysis; that, therefore, the indications of hearing continuing after section of the canals proved that they were not necessary to audition.

Section does not necessarily mean destruction, inasmuch as the recovery of pigeons after section of a canal indicates that

the function still continues. In order to decide the point Cyon extracted the membranous labyrinth bodily. Even after this, indications of acute sensibility to sounds continued. Hence, the nerve supplying the semicircular canals is not the nerve of hearing, and the so-called auditory nerve must be considered as composed of two nerves with distinct functions—the auditory, and the "nerve of space." This division of the auditory nerve is borne out also by the two distinct anatomical origins of the eighth nerve as described by Stieda. Hitherto zoologists have been in the habit of regarding every terminal organ of the eighth nerve, or its homologue, as an organ of hearing. This, however, is more than problematical. An organ of hearing would be of little use to many animals, whereas an organ of orientation would be of immense service; and in fact, as we descend the animal scale, the cochlea is the first to disappear, while the canals and the sacculi persist.

He details some experiments on lampreys which have no cochlea, but only one sacculus and two semicircular canals.

The disposition of this organ is very unfavourable for acoustic purposes, being enclosed in a cartilaginous case, having only one opening (for the nerve), and covered by a thick cushion of muscle. Practically, lampreys do not exhibit any reaction to sonorous vibrations. On the other hand, section of the canals gives rise to very marked motor disorders, in all respects analogous to those observed in pigeons, &c.

On this point M. Cyon proposes to carry out further investigations.

The subject of which M. Cyon treats in this manner is one of great importance and far-reaching significance, and he has enriched it by many new and valuable observations. It would be impossible to attempt at this time to follow out in detail the bearing of M. Cyon's observations on the relations subsisting between the semicircular canals and the ocular movements. But it is obvious that the phenomena described by M. Cyon, and those which I have described as resulting from electrical irritation of the cerebellum, require to be considered together, and that M. Cyon's researches support the view which I have elsewhere expounded, that the cerebellum is the centre where that intimate physiological relation subsists between the

eyes and the semicircular canals of which he speaks. It appears to me, however, singularly unfortunate that M. Cyon should have mixed up physiological with metaphysical and psychological questions in the way which he has done. Cleared from this confusion, M. Cyon's facts and arguments establish very firmly the importance of the semicircular canals in the consensus of impressions on which our co-ordination in space is so dependent. But to make this co-ordination depend, as M. Cyon's language, interpreted literally, would imply, on abstract notions of space with three dimensions, and to explain physiological by psychical disturbances, is to confound things which ought to be kept separate. Surely M. Cyon does not consider it necessary that an animal should have formed an abstract notion of space with three dimensions before it can maintain its equilibrium. And how it is possible for abstract notions to be constructed out of "unconscious sensations" is difficult to conceive. Letting the term "unconscious sensations" pass without comment, not even Mr. Lewes would hold that centres endowed only with this form of sensibility are capable of ideation and abstraction. Yet we know that, after removal of the cerebral hemispheres, the functions of equilibration and motor co-ordination may remain intact. Cut the semicircular canals and the same disorders ensue. It can scarcely be said that in this case the motor disorders depend on a psychical dis-harmony between space seen and ideal space as M. Cyon puts it.

M. Cyon's work, however, may be considered apart from such defects, and I desire to express my high appreciation of its value.

D. Ferrier.

Clinical Cases.

CASE OF CEREBRAL TUMOUR.

BY JOHN HADDON, M.D.

John H., aged 38 years, a warehouseman, was seen in March 1876.

Previous history.—Has always been a strong, healthy man until the present history began.

In September 1874 he noticed a swelling on the top of his head, which continued to increase in size until March 1875, and has not grown any larger since. His health was in no way affected by the swelling, so far as he knew.

In August 1875 he had an attack of severe vomiting, and was attended by a surgeon, who said it proceeded from inflammation of the stomach. During this attack he for the first time felt a slight tingling down the left leg; but it passed off, and he thought himself quite well again.

In October 1875 the left leg began to feel weak and numb, and at the beginning of 1876, when he had to use a stick in walking, he sought medical advice.

In February 1876 the left arm began to feel weak, and in March he became quite unable to walk alone.

When seen in March, he had a tumour situated just behind the coronal suture, to the right of the middle line, whose base covered an area about the size of half-a-crown; and the hypodermic needle, passed through its most prominent point, came in contact with the skull, when it had reached three-quarters of an inch from the surface. At the base of this tumour, and to its left side, a smaller tumour about the size of a horse-bean was detected. There was no pain about the tumour, and it was solid and nodulated.

He could not walk without help, and when walking the left leg was swung from the hip by a movement of the

trunk. When the foot came to the ground, he could support his weight on it, so as to walk. As he sits he cannot move the thigh, leg, foot, or toes, but he can resist my bending the foot, and then the whole leg gets into a tremor. The left arm is numb and weak, but he can move it well enough.

Sensibility is unimpaired. The muscles are soft and flabby. He has occasional twitchings in the left leg, and suffers from pain round the body about the lower ribs, which often keeps him awake in the night. The right side is normal. The optic discs could not be distinguished from the rest of the fundus. His appetite is good, the bowels regular, and urine normal. He has no cough, or difficulty in breathing. His pulse occasionally intermits, and at times there is a systolic bruit at the cardiac apex.

In the beginning of April the movement of the left arm was awkward, the fingers remained straight, and looked useless.

On April 19th he could not move the left arm.

On April 21st a tumour of the cæcum began to obstruct the bowels.

May 5th.—The right leg is now weak. He complains of pain on the top of the head and in the left leg.

May 10th.—The right pupil is less than the left. He thinks he sees some one in the room, and his wife says he has strange fancies.

May 17th.—Left arm is rigidly contracted in semiflexion. The right hand shakes when he tries to use it, and the right leg is also partially paralysed. He complains of pain in the head.

May 19th.—Lies quiet with his eyes closed, and takes no notice. He cannot elevate the eyelids fully when he tries. He passes urine in bed. The left arm and leg are flaccid again. The voice is very feeble. He sweats profusely, and the pulse is 130.

On May 22nd he died quietly.

P.M.—The scalp being removed, the tumour was seen of a conical form, with a small one on its left side. On attempting to remove the calvarium, it was found adherent under the tumour. Force being used, the skull cap came away, with the tumour on its upper surface, and on its inner surface a thin and excavated part was seen, into which a tumour, now adherent to the dura mater, had fitted.

The thinning of the skull began half an inch behind the coronal suture on the right of the middle line, and was as large as a crown-piece in extent. The skull at that part was quite translucent, and the surface of the internal tumour had a rough spicular appearance.

Report as to the position and relations of the Tumour on the Brain, by PROFESSOR WATSON, *of Owens College, Manchester.*

The tumour arose from the dura mater covering the upper surface of the right cerebral hemisphere. It presented a cauliflower-like mass of an almost circular form, measuring two inches in diameter, and projected to a slight extent above the level of the cranial surface of the dura mater. It was situated immediately to the right of the middle line, and its deeper aspect was in contact with the right side of the falx cerebri; but a small

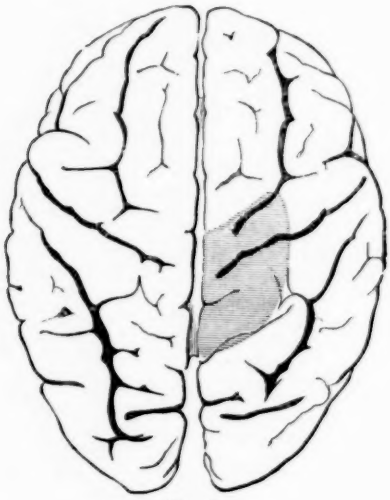


FIG. 1.

part of it extended to the left side of the middle line, so as to rest upon the vertex of the cerebral hemisphere of the left side. On separating the dura mater from the surface of the brain, along with the attached tumour, the latter, which was of a very irregularly nodulated form, measuring three inches in diameter in all directions, was seen to protrude itself into the substance of the right cerebral hemisphere, extending as far as the floor of the lateral ventricle of the same side. In its growth downwards it appeared to have carried in front of it the cerebral pia mater, which could be stripped off the surface of the tumour without difficulty. The tumour itself on the surface of the brain corresponded to, and had obliterated in the course of its growth, a portion of cerebral substance

extending from the ascending limb of the Sylvian fissure in front, to within an inch of the external parieto-occipital fissure posteriorly. (See figs. 1 and 2.)

From within outwards it had implicated and destroyed the surface of the hemisphere, from the great longitudinal fissure on the inner side, to a line prolonged backwards from the sulcus which separates the upper from the middle tier of frontal convolutions, on the outer side. Consequently, on the *outer* surface of the hemisphere the following convolutions were destroyed by the tumour:—

(*a*) Upper half of ascending frontal.
(*b*) Upper half of the ascending parietal.
(*c*) Anterior half of the postero-parietal lobule.

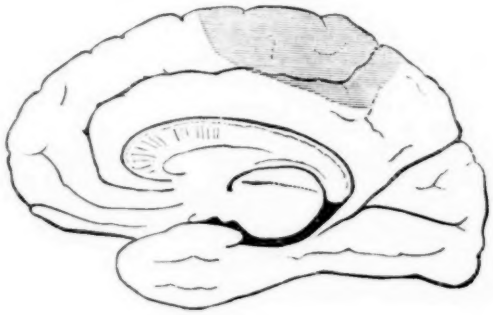


FIG. 2.

On the *inner* surface of the right cerebral hemisphere the following convolutions were involved by the tumour:—

(*a*) The marginal convolution, which was completely destroyed for a distance of two inches in front of its posterior extremity.

(*b*) The anterior half of the quadrilateral lobule.

(*c*) The upper portion of a corresponding extent of the gyrus fornicatus.

Both of these were completely destroyed to the extent indicated.

With regard to the depth to which the tumour extended into the hemisphere, I have stated that it reached as far as the floor of the lateral ventricle of the right side, projecting even into the descending corun of the lateral ventricle. In the course of its growth it had completely destroyed—

(*a*) The fibres of the corpus callosum, except about an inch anteriorly of that structure.

(*b*) The intra-ventricular portion of the corpus striatum.

(*c*) The upper surface of the optic thalamus. In short, all that portion of the hemisphere intervening between the surface and the floor of the lateral ventricle was completely disorganized.

With regard to the portion of the tumour which rested on the left hemisphere, it may be mentioned that it compressed and dimpled the upper extremity of the left ascending frontal convolution, but it was not in any way disorganized by the tumour.

REMARKS.—The tumour would appear to have begun on the outer surface of the cranium, probably in the periosteum, whence it grew upwards for a period of six months, during which time there is no account of any symptoms. We have no history of any mischief until five months after it ceased growing upwards. During the five months it is probable that it was making its way through the bone. Having reached the dura mater, its growth would be more rapid; and it is probable that it was in August 1875 that the first pressure upon the brain occurred, and the point upon which pressure would first be felt must have been on the right of the middle line, and probably about an inch and a quarter behind the coronal suture. The first effect of the pressure was an attack of sickness, with tingling down the left leg.

The effect of the first pressure having passed off, he had no fresh symptoms for about six weeks. Paralysis then showed itself in the leg, and in the leg alone; and so well was he in every other respect, that the practitioner whom he consulted told him it was quite a local affection and would pass off. The leg gradually got weaker, and for five months it alone was affected. At the end of this period the left arm began to undergo the same process, but not until the paralysis of the leg was complete. In about two months after the first feeling of weakness in the arm it was completely paralysed. In another fortnight the right leg began to be affected, probably from the growth of the tumour across the middle line, upon the left hemisphere. A few days afterwards his reasoning powers became affected. In a few days more, rigidity of the paralysed left limb occurred, and continued for two days. Ptosis, probably paralysis of the sphincter of the bladder, and profuse perspiration were the only other symptoms before death, which was caused by a tumour in the cæcum.

It would appear, then, that the cerebral substance pressed

upon by the descending tumour was in the region occupied by the upper parts of the ascending frontal and ascending parietal convolutions, and the anterior half of the postero-parietal lobule; and further it is highly probable that these parts were pressed upon in the order in which they are mentioned.

We appear, therefore, to be justified in concluding, that pressure upon the upper part of the above-named convolutions of the right side in this case caused paralysis of the opposite leg, and that the centre for the leg is situated in this region, as indicated by Ferrier's researches.

TRAUMATIC LESION OF LEFT HEMISPHERE—RIGHT BRACHIO-FACIAL PARALYSIS—APHASIA—ANTISEPTIC TREATMENT—RECOVERY.

BY W. MACCORMAC, F.R.C.S.,

Surgeon to St. Thomas's Hospital.

T. S., ætat. 27, bricklayer, was admitted into the Leopold ward, St. Thomas's Hospital, on April 20, 1877.

Was working at some new buildings when a brick fell from a height of 30 feet, striking him on the left side of the head.

State on admission.—There was a contused scalp wound, somewhat semilunar in shape, just posterior to centre of left parietal bone: the scalp was stripped for about ¾ inch round the wound; the pericranium detached for about the same distance. There was an oval-shaped depression of both tables of the skull, and great comminution of the bone, which was driven some way into the brain. Pulsation was distinctly seen in the wound, and several small fragments of red brick were loose in it. Patient walked from the fly up the steps into the hospital. He appears to understand when spoken to, but cannot make any answer; did not make any sign of pain. Pupils dilated, and act slowly; they were equal. Soon after admission marked paralysis of right side of face was observed; tongue protruded to right side. Some twitchings of left side of face and limbs. There is loss of power in right arm.

Treatment. April 20, 1878, 11.30 A.M.—Under the carbolic spray, and without the use of any anæsthetic, Mr. MacCormac enlarged the wound backwards and forwards; the projecting edge of outer table was clipped away with a parrot-bill forceps. It formed an overhanging ledge all round the inner table, which was much more extensively fractured than the outer, and a number of pieces of bone, now rendered loose and accessible, were removed; one larger than the rest had punctured the

dura mater, and was driven about ¾ inch into the brain. The wound in the dura mater was of the area of a sixpence; the exposed brain was pulpified, and a small quantity escaped; the exact seat of the injury was about the mid-point of a line drawn from the tip of the ear to the sagittal suture of skull, and rather nearer the middle line than the ear. Several smaller pieces were also removed from the brain. These were covered with short hairs impacted between the fragments, and a small piece of his cap lining was also removed from the brain, together with a small black clot like a pickle of shot.

At the time of the operation the patient did not appear to feel pain, though he has since said he was quite conscious of what was going on. The wound was carefully cleaned with carbolic lotion, the edges were brought together with wire suture, and two small drainage tubes introduced at each extremity of the wound; carbolic gauze dressings were applied, and asepsis throughout maintained. Put to bed; had a cold coil applied to the head.

10 P.M.—Has not spoken. Temp. 102·2°; pulse 68. Breathing steadily; limbs twitch at intervals; passes water naturally, making signs when he wants to.

April 21*st*.—Slept at intervals during the night; understands when spoken to; pupils equal; facial paralysis marked; right arm seems almost completely paralysed; lies towards the injured side. Wound dressed under carbolic spray, the edges in exact apposition and united. Scalp over wound pulsates, as does also the fluid in drainage tubes. A small quantity of bloody serum in dressings.

10 P.M.—Is shouting out; muscles still twitch; retches at intervals, but is not sick. Cannot answer questions, though he apparently understands them.

April 22*nd*.—Cried out during the night; still retches—no vomiting. Fluids inclined to dribble from right side of the mouth; wound dressed; no suppuration. Some stitches removed. Primary union took place throughout, except at points where the drainage tubes were inserted, and this even in the margins of the original wound which had been contused by the brick.

April 23*rd*.—Paralysis of right arm more marked; sordes round lip; tongue thickly furred and protruded to right side; lies quietly in bed; cannot speak; no more twitching.

April 26*th*.—Has been very quiet, and rather more conscious; no suppuration. Movements of eyes not affected; can evidently see; is very quiet; smiled on being shown a penny, and asked what it was. Given a paper upside down, he immediately turned it the right way. No loss of sensation in

right arm, though great loss of power. Scapular muscles not paralysed.

April 27th.—During the early part of the day patient seemed much as usual, but at 4.5 P.M. was suddenly seized with a fit of convulsive twitchings of the muscles of the face and jaws. He became unconscious. Pupils dilated; conjunctiva sensitive. The right facial muscles twitched violently; left not affected. Eyes persistently turned to right side. Left arm was rigid for the first ten minutes. Face flushed, but not livid. Temp. in right axilla 98·8°; left 98·4°. Pulse 60, regular. After the symptoms had continued an hour he had a sudden epileptiform convulsion of the whole body, lasting about two minutes. The twitching movements now subsided, and by 6 P.M. consciousness had returned.

April 28th.—Passed a quiet night, and his condition seems the same as before the fit.

May 1st.—Power is returning in muscles of right forearm, as he can move his fingers and just grasp a hand. Takes notice of things going on in the ward.

May 2nd.—Has greater power in forearm this morning. Can give a fair grasp. Tries to answer questions, but can only mumble something that might be taken for "Yes" or "No." Was given a pencil and paper, but he could not take a good hold of it, though he evidently wished to write.

May 3rd.—Power increased in right arm; after a good many attempts to write his name, he wrote "Thom," and seemed to think it a great joke. Facial paralysis less.

May 6th.—Seems in better condition to-day; tongue cleaner, and not protruded to right side so much. Asked his neighbour how he was; wrote on a slate "tea, bread, and butter," and, when asked, said he was hungry.

May 9th.—Is improving fast. On being questioned, says he remembers how the accident happened, his being taken to a chemist, then to the hospital, and also remembers the operation; he remembers every little detail and fact; talks slowly, having at times to think of words to express himself. Has more power in right arm.

May 22nd.—Has been gradually improving. Can now talk fairly well. Facial paralysis almost gone; also paralysis of right arm.

June 1st.—The patient may be now pronounced convalescent. He has been up and about for some days. The strictness of his diet is relaxed. His speech is deliberate, but quite perfect; and all the bodily and mental functions appear to be otherwise quite perfect.

REMARKS.—So complete and satisfactory a recovery does not usually follow a depressed compound comminuted fracture of the skull, with injury to the dura mater and brain. Inflammation of the brain and its coverings, accompanied by suppuration, too often occur. The only untoward incident was the attack of convulsion on the eighth day. For fourteen days he may be correctly styled speechless. To any and every question he replied in the same way—with an inarticulate grunt. "No" was the first word which could be recognised. He was able to write what he wished to say before he could speak it, and would probably have been able to write much sooner but for the paralysis of the arm. His intelligence was very little, if at all, impaired. He had no symptoms of concussion, was able to walk into the hospital, and remembered perfectly the incidents of the treatment and the operation he was subjected to. The temperature chart is interesting. Within two hours of the injury the temperature recorded was 103·4°, which was certainly not due to any septic change. On the next and succeeding days it became gradually lower, reaching the normal standard on the seventh day, above which it never again rose. It was rather below the normal standard the day he was seized with the convulsion, during which it did not rise. There was at no time a tendency to fungous protrusion of the brain, thus corroborating the view that this is chiefly due to inflammatory hyperæmia and exudation. The man is now, more than two months after the injury, quite well.

Note by Dr. Ferrier.

Besides its importance from a surgical point of view, this case is of interest in reference to the localization of cerebral functions. It shows, like the cases which have been recorded by Broca, Sydney Jones, Simon, Proust and Terillon, and Lucas Championnière, that the occurrence of aphasia with lesion of the left hemisphere is no mere coincidence to be explained away by the greater frequency of lesions of the left hemisphere as compared with the right.

The exact seat and extent of the cerebral lesion could not be made out, but the position of the cranial injury was such as to ensure damage to the lower half of the ascending convolutions; and hence, as experiments would have led us to expect, paralysis of the face and arm on the right side, with aphasia.

The lesion seems, in the first instance, to have concentrated itself in the facial and oral centres, the motor centres for the hand and arm being only partially involved, but, as is so

frequently seen in cortical paralysis, the lesion seems to have extended secondarily into these, rendering the dextral paralysis more and more complete.

It further bears out the statement that paralysis of cortical origin is unaccompanied by lesions of sensibility. Besides the paralytic symptoms, certain convulsive phenomena were observed at first, these being seen on the left side, explicable, as Duret has shown, by irritation of the nerves of the dura mater: convulsive movements due to irritation of the dura mater occurring, as a rule, on the same side as the lesion.

CASE OF GENERAL PARESIS OF THE INSANE.

BY G. HUNTER MACKENZIE, M.D. EDIN.,

County Asylum, Gloucester;

With Observations by F. A. MAHOMED, M.D.

W. G., male, æt. 39, married, coal merchant, admitted into the Gloucester County Asylum on 12th February, 1877.

History.—Was formerly a sailor; no hereditary predisposition to insanity, nor other constitutional disease. Had always enjoyed good health until a few months previous to admission; had lately had several "fits," recovering from them in about an hour. Has not been intemperate, nor addicted to sexual excess. Has been in rather straitened circumstances lately. Of a quiet disposition; has been married a little over three years, and is the father of one child. Mental derangement of about two months' duration.

Condition on Admission.

Physical.—Under the average height; fairly muscular; pupils slightly unequal, the left being the larger, and acting sluggishly. Facial curves not well pronounced, especially on left side. Tongue vibratory; articulation thick, with an especial difficulty in pronouncing explosive labials. Pulse 100, very small, with first cardiac sound almost inaudible at all the areas: slight comparative dulness at right supra-clavicular region. Urine phosphatic.

Mental.—Has delusions of grandeur—that he possesses money, estates, and everything else a man might wish for. Feeling of *bien être* well marked; says he never felt better or stronger all his life. Struts about in a grandiose style.

Diagnosis.—General paresis of the insane.

Course of Case. May 20th, 1877.—Has had several attacks of excitement, as also some congestive apoplectiform fits. Had one of the latter to-day, when his condition was as follows:—

"At 11 A.M. he became momentarily insensible, and aphasic. Conjunctival vessels injected, pupils slightly unequal, the left being the larger; eyes rolling towards left; at its upper internal aspect the left iris is somewhat narrowed. Pulse 80, small, regular; left arm partially hemiplegic, with diminished sensibility. On recovering sufficiently to be able to walk, he dragged the left leg slightly, and could scarcely stand."

The subsequent course of the case was characterised by more or less excitement, interspersed with frequent congestive attacks, and with gradually augmented paresis. The excitement became more delirious in character, and subsequently, when the paralysis had greatly increased, and the patient was consequently more confined to bed, assumed a low muttering character.

Nov. 15*th.*—Is in a condition of low, muttering delirium, following an attack of acute delirious excitement. Present state:—Pupils slightly unequal, the left being the larger; both contract sluggishly, but more especially the left; muscles tremulous (subsultus tendinum), more so in the left upper extremity than the right; grasp of left hand slighter than right. Can stand erect with eyes closed, and feet wide apart. Reflex power present in legs. Asked to close his eyes, he protrudes his tongue, which is very vibratory, is soon withdrawn, and rolled about mouth. Head unsteady, jactatory, and falls forward to the right side. Lower jaw inclines to drop. Temp of left axilla 98·3°; right 98·1°.

Nov. 20*th.*—A severe attack of excitement has ended in a convulsive attack, from which he can be only partially aroused. The convulsions last about five minutes: pupils medium, slightly acting, unequal, the left being the larger; conjunctiva sensitive; reflex movements and sensation absent from feet, legs, and arms; mouth slightly drawn to the left side; clonic contractions of muscles of right arm and leg, not of face; falls towards right side. The application of snuff to nostrils did not produce sneezing. Two hours subsequently, he is still somewhat somnolent, but can grasp properly with right hand; breathing somewhat stertorous; resists forcible extension of limbs; will not allow his eyes to be looked at; reflex power present in both legs, mostly in right. Twenty hours subsequently, he had become very quiet, with subsultus tendinum and apparently augmented reflex action, especially on tickling soles of feet.

Dec. 8*th.*—Had a hemi-convulsive attack, affecting principally left arm and leg.

Dec. 11*th.*—This afternoon at 4.30 had an attack of coma without convulsions. His condition at 6.30 was as follows:—Temp. 96°; pulse 110, rather full and soft; resp. 10 per minute,

with peculiar characters, the respiratory movement being stertorous, with short inspiration. This stage of coma was broken by the occurrence of a convulsion which commenced with gulping and other evidences of impeded respiration. The convulsions were now general and of equal intensity throughout the whole body, the head being turned alternately from side to side, the pupils widely dilated, and the breathing stertorous. Each lasted from two to three minutes, the muscular twitchings remaining longest on the right side. Immediately after the cessation of the convulsion the temp. was 96·7°, pulse 110, resp. 16,—the inspiration being a short sharp snort, and the expiration from sixteen to twenty times longer than the inspiration. The pupils became contracted and equal, and not acting, with no evidence of sensation or reflex power. The convulsions recurred for several hours, and at 10 P.M. the temp. was 100·1°, resp. 21, of the same character as before; pulse 115; clonic jactatory spasms of left arm and forearm; no muscular twitchings in legs, and almost none in right arm.

Dec. 12th.—At 9 A.M. temp. 99·3°, pulse 112, resp. 24; muscular spasms continue on left side. At 11.30 A.M. temp. 99°, resp. 20, pulse 104; consciousness slowly returning. At 7 P.M. temp. 99·5°, pulse 104, resp. 25, quiet; pupils in medium contraction, the left being the larger; unconscious.

Dec. 20th.—Has been in a condition of more or less somnolence since last report, with muscular twitchings of face; limbs rather flaccid, but occasionally the flexor muscles of arms were rigidly contracted. To-day reflex power and sensation in feet are decidedly diminished; the right foot is cold, the left hot; sensation deficient over whole body; has taken food very well.

Dec. 24th.—Died. Nothing worthy of note has occurred since last report.

(Autopsy refused.)

Dr. Mahomed has kindly made the following observations on the sphygmographic tracings[1] in this case:—

The tracings recorded in this case are of great interest; they may be divided into three classes or types, all of which are exceedingly well marked, and appear to occur under similar circumstances with invincible consistency.

1. There is the tracing obtained during periods of quietude. It is seen on March 27 and Nov. 14. It is a tracing indicative of contracted vessels (though not of "high tension," there being little or no evidence of capillary resistance), with a feebly and deliberately acting heart. This form of pulse is seen

[1] The pressure employed in taking the tracings is considerably higher than normal on account of a peculiarity in the instrument.

occasionally in health, but usually in more or less feeble persons. It is readily produced by the application of cold to the surface, or by cold bathing; it is seen in Addison's disease and in peritonitis; it is thus especially associated with conditions in which the sympathetic system is involved.

2. Another characteristic type is that produced by irritative fever; it is seen on Oct. 15 and Nov. 12. It is a quick, or rather "frequent" pulse, occurring in contracted vessels, and therefore producing only a short upstroke, yet with the percussion and dicrotic waves more evident than in the rest. From its frequency it would be the pulse of fever, but its occurrence with contracted vessels robs it of the usual characters of the febrile pulse, which depend chiefly on the dilatation of the vessels. A similar pulse is seen in some conditions of pyæmia, low forms of surgical fever, so-called irritative fever, and in the first stage of ague.

3. The last type is that indicative of the exhausted and failing heart; this is seen on Oct. 30, Nov. 10, Nov. 19, Nov. 20, and Dec. 4. The characters of these tracings are, first, the annihilation of the percussion wave, producing a sloping upstroke, the result of the enfeebled contraction of the heart; secondly, the absence of the dicrotic wave, owing to a similar cause, the contraction being too weak to produce a wave of elastic recoil.

The other tracings combine, more or less, the features of some two of these types.

ACUTE MANIA ASSOCIATED WITH ABSCESS OF THE BRAIN.

BY GEORGE H. SAVAGE, M.D.,

Bethlem Royal Hospital.

I HAVE seldom met with cases, dying in an attack of mania, in which coarse brain disease was found.

It is not uncommon to have acute symptoms with syphilitic tumours, and I have the records of three cases in which the insanity was due to such tumours, the local paralyses and the insanity passing off with treatment of the syphilis. These cases recovering, no opportunity was afforded of confirming the localization of the disease made from lesions of certain cranial nerves.

Cases die from attacks of acute mania, and every year at Bethlem we have one or more of such cases. In these the changes in the brain may be general, but they are minute, and not at once seen by the naked eye. In not a few cases, the death, though occurring in acute mania, is not due to it, the mental disease commonly masking other diseases. Thus we may find, *post mortem*, advanced phthisis, pneumonia, pyæmia, pleuritic effusion, or evidence of other severe diseases, that were not only unsuspected, but hardly to be detected—cough, pain, and even increased temperature, being absent.

Besides these masked cases, however, I have seen others die of acute mania, in whom no general disease was found, all the viscera being typically healthy. In these cases, the brain always showed some changes, if carefully sought, such as congestion of membranes, effusion of fluid, or a general softening of the brain. I have specimens, showing that a form of inflammation may be present, the cortex and membranes adherent, and leucocytes and new growth infiltrating the superficial layers of the brain.

In the case I bring forward in this paper, we have a distinct

lesion in a brain that was unstable by nature. The case presents many points of great interest.

In referring to causes of insanity, all authorities agree that the most important is an inherited tendency, or its equivalent, viz. a tendency shown to exist in the family by several near blood-relations suffering. In our case, the father died of some brain disease, said to have been "softening," but which I prefer to believe was a simple dementia rather than general paralysis; for the evidence of the rest of the cases goes to support the idea that, when the period of life associated with beginning decay was reached, the members of the family tended to die by their nervous systems.

Again, I have yet to learn that general paralysis in a parent tends to produce ordinary insanity in the offspring.

The patient had certainly three other female relations who have suffered from insanity, so we may be sure that she belonged to the class that is ever ready to break down.

In the three attacks of insanity, there were different exciting causes in each. I do not attach much importance to any one moral cause given; for one cause reacts on the other and complicates it, and also induces other physical disturbances, which all tend to the precipitation of the attack. The symptoms of melancholy that were seen in both sisters are noteworthy. It is my experience that it is very common to see sisters suffering from similar forms of mental disease, and we have had several pairs in Bethlem with the same types of disease. We have now two sisters suffering from delusional insanity, and the suicidal tendency is constantly seen to run through a whole family, or along the male or female side of a family.

I may also remark here, that I have seen certain families predisposed to suffer from similar causes. Thus I have records of both mothers and daughters who have had insanity following child-birth, and, in fact, we have at present in Bethlem a patient, whose mother had puerperal insanity, now suffering from insanity due to the same cause.

I subjoin the history of the attacks, from which the patient was under observation, and short notes of the attack of the sister, who was also under our care in Bethlem. The first attack of insanity was in 1862.

Sarah N., single, æt. 35. Aunt and cousin insane. Father died of "brain softening."

About five years before she had a love disappointment, and since then on several occasions had had short attacks of mental excitement, but these rapidly passed off, leaving no mental deterioration.

The exciting cause of the present symptoms seemed to be

money troubles. She said, "Fiends constantly prompted her to do evil things, and to escape them she must kill herself." She had cut her throat rather considerably.

On admission, she was dull and desponding, suffering from melancholia. She was treated with morphia and steadily improved, so that, at the end of three months, she was reported as well enough to go on leave, and was afterwards discharged cured.

Second attack in 1869.—Religious difficulties given as the cause of this attack. Symptoms similar to last attack. Loss of self-control; impulses to blaspheme. Had lost all pleasure in ordinary affairs. Suicidal, very anæmic and emaciated, having refused food. Untidy and dirty in her habits.

She slowly improved and went on leave of absence, after having been in Bethlem five months, and was again discharged well.

An elder sister, Mary N., was admitted into Bethlem in 1873, suffering from active melancholia. After three years' treatment she was discharged uncured, suffering from chronic melancholia of an active kind. This patient was constantly wringing her hands and saying, "I don't know what to do." This sorrow became quite automatic, for she ate and slept well, and gained some strength before her discharge.

Last attack in Sarah N.—Admitted March 13th, 1878. Business troubles given as the cause. About six months before admission, was noticed to be unlike herself, and to be generally in weak health, sleepless and restless. She however improved for a time, but the sleeplessness became more marked, and she was dull and anxious.

In the early part of March she rather suddenly became noisy and violent. She said she had "seen the Lord Jesus," and that "He talked with her." Fancied people had knives concealed and would murder her. She said "her bed was an infernal machine," and that she was "surrounded by devils." She had wonderful visions, talked incoherently, and was very violent.

On admission, she was noisily and incoherently happy, talking and laughing constantly day and night. She was kept up for some ten days or so, but was always rolling about the floor, and taking off her clothes. It was noticed that her tongue was dry and brown. She took only a small amount of food; the bowels were confined, but there was no sickness; pupils uniform. She was too restless to allow a careful examination of her discs. Pulse rapid, small, and compressible. For her own sake, she was kept in bed, and there remained more quiet, though she talked and shouted constantly. Tem-

perature on March 22nd was normal in axillæ, and 92° on temples; and then there were no signs of lung disease.

On April 23rd she was very dirty, and on the 26th we noticed that she had lost power over left arm and leg, the forearm was rigidly crossed over the chest, and the leg extended with the foot turned inwards. There were numerous petechial spots on her left leg; the right angle of the mouth was drawn up.

May 1st.—No alteration in her hemiplegia, but there were now signs of pneumonia in both bases. Temperature (in axilla) 103°, pulse 125, respirations 51. Breathing became worse, and she died on May 2nd.

Post-mortem twenty-three hours after death.—Only the head was examined; calvarium very thin and dense. On removing this, the right tempero-sphenoidal lobe was noticed to be flattened and bulging; on making a slight incision, more than an ounce of thick gluey pus escaped, disclosing a thick-walled abscess occupying the whole of this part of the brain. There was no communication with the ventricles, or with the outside of the brain. There was no diseased bone about the ear or elsewhere; the membranes were free over the abscess. The arteries were patent and normal. The corpus striatum and also the thalamus were softened and broken up, and around the vessels were large spaces. Over the whole brain the membranes were separable. There was general congestion of the pia mater, but no excess of subarachnoid fluid. The rest of the brain was normal in appearance.

I shall only make a few further remarks on the case that seem necessary.

As has so often been pointed out, the form of the attack of mental disease seems to be accidental. Over and over again have I seen patients suffering from excitement, *i.e. mania*, in one attack, and from depression, *i.e. melancholia*, in another. In the case here recorded, however, there was a marked family and individual tendency to melancholia, and the exciting causes also were given as of a depressing nature. In the last and fatal attack, we must look upon the *abscess* as the *real cause* of the *insanity*. The history of some months' illness is quite borne out by the thick walls of the abscess.

It is very unusual to find an idiopathic or primary abscess in the brain, and, as the post-mortem examination was only partial, we cannot exclude many possible causes of abscess. Of only one thing I am sure, namely, that it was unconnected with any disease of the ear or cranial bones.

The absence of any symptoms to lead one to suspect a large abscess in the brain is noteworthy. Thus a cause, sufficient to irritate into mania, may exist, and yet cause no other

symptoms, till other parts, such as the ganglia at the base, were secondarily implicated.

In the attack itself there were two symptoms that made one look upon it as unusual. In the first place, the tongue was dry and brown from first to last, while the temperature of neither head nor axillæ was raised.

The other symptom was the small amount of food taken. A patient so pleasantly maniacal—laughing and chatting—generally takes food freely, but our patient took little or none, though she had no sickness, and did not seem to suffer from nausea.

I am, at present, at a loss for a satisfactory explanation of the above symptoms. They led me to look on the case as exceptional. There was no inflammation of the membranes over the abscess, and thus the case is still more difficult of explanation.

UTERINE DISPLACEMENT CORRECTED AND INSANITY CURED.

BY GEORGE H. SAVAGE, M.D.

In a very great number of cases the expression of the insanity is due to some wrong interpretation of general or special sensations. Thus the hypochondriac with a tendency to insanity has vague, uneasy feelings in his abdomen, and says that he has lost his intestines. Other cases have perverted impressions of many of their senses, and build up an insane intellect out of false or subjective sensations, and are necessarily incurable, as no true or ordinary impressions can be made on them.

The case that I have particularly to draw attention to in this paper does not come under either of the above heads, but is related to both classes, as we shall see. The patient had a definite cause of irritation in a prolapsed uterus, she was also unsettled and unstable from climacteric troubles, and was thus very impressionable, though there is no clear history of neurosis in her family.

E. G., married; forty-five. Has had five children; the youngest is six years old. No history of insane relations.

Cause.—Change of life. First symptoms two months before admission. She began by neglecting her home duties, or performing them badly. She attempted suicide. Destroyed her clothes, and threatened those near her because they "injured her." She wanted to leave home. On admission she was fairly nourished and willing to assist in ward work, but she was always complaining of the injuries done to her. She said that persons put ammonia and acids on all parts of her, and tried to injure her by putting chloroform on her pillow. She destroyed her clothes, and was very demonstrative against the harm done to her.

She continued to have the same delusions without any change for two months. Morphia was tried; it produced

sickness, and did no good, and she refused to continue its use.

We found at this time that her menstruation had for some time been irregular, and that she had had the flushings of heat so common at the climacteric.

Salines and mineral aperient waters produced no good effect.

I discovered that she had a large heavy uterus which was much prolapsed. So I kept her in bed for some days. She was more quiet at first, but finding the uterus would not keep its place when lying down, I used a pessary with a bag at the end, and thus thrust up and maintained in position the uterus.

Within twenty-four hours the patient was more comfortable, and, though she complained of the "chloride of lime" a little, she was evidently improving. Within a week she was comfortable, but the temporary removal of the pessary again caused mental distress.

In three weeks from the introduction of the pessary she went home to her husband, and has remained quite well ever since, now four months.

Local causes of irritation frequently react on the mind, and, though I do not attribute so much trouble to simple uterine displacement as some have done, I have seen many cases in which ovarian or uterine irritation have had some part in the production of the insanity, or else have modified its expression.

Quite recently we had a case in which there was constant tendency to masturbate: the patient seemed quite unable to resist rubbing the clitoris. A pessary (a Hodge) did no good at all, though there was some uterine displacement that was corrected by this; but the advice of a leading obstetric physician to use a vaginal pessary containing bromide of potassium and atropine was at once followed by relief of all symptoms. We have had three cases of ovarian dropsy in Bethlem that I purpose in some future paper collecting and referring to; the only thing in common in their mental symptoms being distress and ideas of unworthiness.

Another patient, with a very large fibroid of the uterus, had ideas that she had been changed at birth.

Other cases that are at present under observation have markedly symptoms due to chronic uterine disease, but these cases are among the hardest one has to treat, for in one associated with constant bearing down pains and discharge of blood and matter there are ideas that she is nightly assaulted, that syphilis has been given to her, and that all sorts of poisons are administered. Any attempts at examining her

are strongly resisted, and chloroform is one of her insane dreads: as she fancies it is constantly being given to her for felonious purposes, we cannot use this to clear up our doubts and carefully investigate the case. This is less to be regretted, as the symptoms arose about the climacteric and she is now advancing in life.

Another case has a constant leucorrhœa, and all her ideas circle round marriage relationships, distrust of her husband, and thoughts that the doctors are going to marry her, or that those around her say, "She is no better than she should be," and otherwise take away her fair fame.

Here, again, we meet the objection to examination.

The misinterpretation of these uterine and ovarian irritations is seen, too, in many cases of puerperal insanity, some being erotic and given to masturbation, while others are given, like the lady with the large fibroid, to lose their own identity, or to mistake other persons.

In one case a patient who had had one previous child with the usual sickness of pregnancy, and became insane after the child's birth, when she became pregnant again and had severe vomiting she refused food, because she thought people were poisoning her and that the poison produced the vomiting.

Uterine irritation does not always act detrimentally. We had one patient who, after childbirth, was insane, and made no improvement till she had a large retro-uterine hæmatocele form, accompanied by great pain and vomiting. She began to improve at once, and was discharged at length well in mind and body, and has had a child since without any recurrence of the insanity.

The question of the unpardonable sin is in very many cases associated with irritation about the reproductive organs. My experience is that nearly all the young women with this idea masturbate; and in women about the climacteric, and widows, among whom this idea is also common, there is always more or less irritability, if not irritation.

The few facts I have placed together above are meant only to enforce the importance of investigating the condition of the genitalia in certain cases of insanity, recognising at the same time the difficulty or impossibility of doing this in some cases.

A CASE OF LARGE TUMOUR OF THE LEFT CEREBRAL HEMISPHERE, WITH REMARKABLE REMISSIONS IN THE SYMPTOMS.

BY J. BURNEY YEO, M.D., F.R.C.P.,

Physician to King's College Hospital.

In the middle of June 1877, a lady, fifty-nine years of age, came under my care, complaining of the following symptoms: general loss of power, especially of the lower half of the body, her right lower limb being chiefly affected; the right foot was lifted from the ground slowly and with difficulty, and the toe dragged in walking. The upper part of the body showed no very appreciable muscular paralysis, although the grasp of the right hand was a little weaker than that of the left, and sensibility all over the right side was undoubtedly diminished.

The patient's mental faculties, which were usually bright and active, and accompanied with much facility in expressing her ideas, were decidedly obscured, and she had great difficulty in finding words to express the simplest ideas. She was much distressed by this difficulty in finding words. She could not write a letter; not only had she difficulty in managing her pen from loss of sensibility in the hand, but she obviously could not command words, and her attempts resulted in an incoherent scrawl, in which a few words only could be recognised.

Her memory was greatly impaired, and although she would attend to and take an interest in what was read to her, she would almost immediately forget it, and take the same interest in its repetition. She appeared capable of recognising external objects, but failed in any close attention to them: *e.g.*, when asked if she could tell the time by a watch, she would say, "Oh yes, very well;" and then when a large watch was presented to her, after looking at it for a moment or two, she would put her hand to her head, and simply look distressed. At this period there was very little complaint of headache or of sickness.

I obtained the following history of her illness from her friends:—She had left England about three months before in fair health, to visit some relatives in the east of Europe; and it was during the homeward journey, after a successful tour, that the first symptoms of her illness appeared. The earliest sign noticed was in a letter received by one of her relatives, written at Malta, which was a little incoherent and badly expressed, and contrasted strongly with her usually carefully written and well-expressed letters. At Gibraltar, after a long walk, she appears to have been attacked with partial hemiplegia, for she was found sitting on the floor in her dressing-room, and it was then particularly noticed that she found much difficulty in finding words, and that her memory had become very defective.

She appears to have recovered partially from this incomplete hemiplegia, but there continued to be much loss of power about the lower part of the trunk, and she remained during the rest of the homeward journey much in the same condition as when I saw her in June, immediately after her arrival.

For a few days after my first visit she continued to be tolerably cheerful, and appeared to take an interest in things around her, and conversed with her relatives and friends; but an attempt to drive in the open air was followed by complaint of severe pain in the head, and the next day a state of complete mental apathy came on, from which it was impossible to rouse her to take an interest in anything. She lay with her eyes closed, pupils equal and sensitive, breathing slowly but regularly, with a good, steady pulse, and taking small quantities of food mechanically. She remained in this low and apathetic state for about a fortnight, giving rise to much anxiety whether she would ever rally from it; when, on the arrival of her son from abroad, she quite suddenly recovered her mental activity and a considerable amount of muscular power. She conversed intelligently, took an interest in what was passing around her, asked questions, and appeared to recover her memory to a great extent, sat up on the sofa, and was able to use her right hand, as well as the left, to some degree. But there was not much recovery of power below the waist.

Soon after this remarkable rally some fresh symptoms made their appearance, viz. severe pains in the head, especially referred to the left side and back of the head, and troublesome vomiting.

I may mention here that croton (butyl) chloral certainly relieved the pain in the head, in from two to six grain doses. Both the vomiting and the headache were greatly relieved by

appropriate treatment, and the mental condition was remarkably influenced all through the illness by the action of the bowels. After free alvine evacuations there was always noticed a decided improvement in the mental state.

This first rally lasted between two and three weeks, when she again passed into a state of complete mental apathy, with apparently general loss of muscular power, as on the former occasion. This lasted about ten days, when another and still more remarkable rally occurred. She sat up on the sofa, would even attempt to get off it, conversed cheerfully and collectedly, was able to take a sort of retrospect of her illness, could use both hands sufficiently well to do a little knitting, took food with relish, had no pain in the head, and no vomiting. This singular improvement, which excited in her relatives and friends much hope of ultimate recovery, continued for nearly three weeks. She then again, and for the third time, somewhat suddenly passed into a state of mental obscuration, not so complete as on the former occasions; but now a curious restlessness affected the right side—the side on which the loss of power had been especially observed—the right hand and arm would be constantly making purposeless movements, and the right leg first flexed and then extended. From this recurrence of the phenomena there was never again a complete rallying as on the former occasions. There was progressive loss of muscular power, but occasional partial recovery of mental activity. About the end of September the loss of power was so general that she was obliged to keep her bed, having up to this time been dressed and moved to a couch in a sitting-room almost daily. Extensive bed-sores formed very rapidly, and were attended by a low sub-pyrexial state, from which she sank on the 14th of October, just four months after I first saw her, and about five months from the appearance of the first symptoms.

A post-mortem examination of the brain was permitted, but it had to be performed hastily, and under difficulties which precluded the possibility of a detailed examination of that organ being made.

The posterior part of the left hemisphere was greatly increased in size, and prominently bulged by the existence within its substance of a large oblong tumour (having the microscopical characters of glioma), about the size of a goose's egg, or rather larger, and weighing nearly six ounces. It did not extend beyond the posterior half of the hemisphere; it was situated chiefly in the white substance of the posterior lobe, and quite centrally. It did not extend to the upper surface so as to reach the convolutions, nor to the inferior or inner surface, so as to interfere with any of the structures at the base of the

brain, or in the floor of the ventricles. But owing to the greatly increased size of the left hemisphere, the structures at the base of the brain were curiously altered in position; one half, the left, being, as it were, pushed forward, so that parts which should have appeared horizontal (*e.g.* the optic commissure) had an oblique direction. I had the advantage during the course of the illness of the co-operation of Sir Wm. Gull and Dr. Hughlings-Jackson. During the early part of the illness we hesitated somewhat in expressing a positive opinion as to the precise nature of the disease; we were soon, however, convinced that we had to do with a case of cerebral tumour. The discovery on ophthalmoscopic examination of double optic neuritis confirmed our opinion. We were enabled also to trace in the family history evidence of the existence of a tendency to malignant disease.

The most remarkable feature in the course of this case was the several decided rallies to which I have called attention. The improvement was on the two first occasions so striking, and on the second occasion so long maintained, that it was with difficulty we could persuade the patient's relatives and friends that we had before us a case of inevitably fatal disease. The *central* position of the morbid growth will no doubt help to account for this, as it will also account for the absence of complete hemiplegia, of any local paralysis, of convulsions, and of delirium.

Abstracts of British and Foreign Journals.

The Brain and Cervical Nerves of the Manatee.—The Brain of the Manatee (*Manatus Americanus*) has been lately described by Professor Garrod, at p. 142 of vol. x. of the *Transactions of the Zoological Society*, and illustrated by a plate (Pl. XXX.) of four lithographic figures. Dr. Murie had previously described and figured this organ in his splendid monograph upon the Manatee (*Trans. Zool. Soc.*, vol. viii. 1872), but the specimen was not in the best condition for investigation. Dr. Garrod was fortunately enabled to remove the brain of the Manatee which he dissected within twenty-four hours after death. There are no convolutions "properly so called." The Sylvian fissure is large, and bifurcates high up. A hippocampal sulcus gives origin to a hippocampus major, and the calloso-marginal furrow is well marked. The corpus callosum is short, and the anterior commissure small. There is, finally, no posterior horn to the lateral ventricle.

Dr. Murie states in his monograph, that in the specimen dissected by him there were eight pairs of cervical nerves, of which two pairs issued between the second and third cervical vertebræ. Hence he is led to infer that the presence of only six cervical vertebræ in the Manatee's neck is to be explained by the supposition that the third cervical vertebra is suppressed, leaving the two pairs of cervical nerves behind it—the third and fourth respectively—unrepresented by a vertebra. Professor Van Beneden, of Liège, found, however, on dissecting a Manatee in Brazil, subsequent to the publication of Dr. Murie's paper, that there was only one pair of cervical nerves in the position indicated. Quite recently, too, Professor Ray-Lankester fulfilled a particular request of the Liège Professor, in making a careful dissection of the cervical region of the Manatee in the hands of Professor Garrod, and found the following arrangement of cervical nerves:—A single pair of nerves issues between the occiput and atlas, a single pair between the atlas

and axis, a single pair between the latter and the third vertebra, and again a single pair between the third and fourth vertebræ, and so on for the interspaces between the fourth and fifth, fifth and sixth, and the sixth cervical and first dorsal vertebræ. The third pair of cervical nerves is certainly much larger near its origin than is either the first or second nerve; but the most marked increase in bulk is to be seen in the fourth pair, which issues between the third and fourth cervical vertebræ. There was, finally, no trace of any additional nerve, or of any structure which could be taken for such a nerve, in the interspace between the second and third cervical vertebræ. The third cervical nerve is connected with the fourth by a slip, and furnishes through this the highest origin for the phrenic nerve. All the nerves were most carefully traced to their origin in the medulla.

The Brain of the Chinese Water Deer.—Professor Garrod, in some 'Notes on the Anatomy of the Chinese Water Deer (*Hydropotes inermis*),' published in the *Proceedings of the Zoological Society* for 1877, gives a figure, accompanied, at p. 791, by a short description of the brain of this ruminant. This organ is stated to be much like that of the Pudu Deer (*Cervus pudu*), already described and figured by Professor Flower (*Proc. Zool. Soc.*, 1875, p. 177), differing mainly from it in that the hippocampal gyrus is much less conspicuous upon the superior aspect. It is much more convoluted than the brain of the Musk-deer (*Moschus moschiferus*), *ibid.* figs. 11–13, upon the typical ruminant pattern.

The Brain of the Three-banded Armadillo.—In the first part of the *Proceedings of the Zoological Society*, for 1878, Professor Garrod describes (p. 226) and gives four figures of the brain of *Tolypeutes tricinctus*, one of the genera of three-banded armadillos. As yet the brain of no kind of *Tolypeutes* had been described, for in the specimen which formed the subject of Dr. Murie's most elaborate monograph upon *Tolypeutes conurus*, in the *Transactions of the Zoological Society*, vol. xxx., this organ had met with an accident. Professor Gervais, in his 'Mémoire sur les Formes cérébrales propres aux Édentés vivants et fossiles' (*Nouvelles Archives du Muséum*, tom. v.), gives a figure (Pl. II., fig. 8) of a cast of the interior of the skull of this armadillo, but this can afford at the best but meagre and somewhat conjectural information. The brain of *Tolypeutes* differs but little in general appearance from that of *Dasypus sexcinctus*, the six-banded armadillo, described and figured by Professor Turner in the *Journal of Anatomy and Physiology*, vol. i., 1st series, p. 313, 1867; but in surface markings it more

closely resembles the brain of *Tatusia peba*, as figured by Rapp in his well-known monograph—'Anatomische Untersuchungen über die Edentaten,' 2te Aufl., Taf. VIII., Fig. 3: Tübingen, 1852. The Sylvian fissure is only represented by an open and shallow angle. The olfactory lobes are very large and broad. On the surface of each hemisphere are two sulci—one anterior and horizontal, dividing the frontal region into two parts, while the other fissure runs longitudinally. The corpus callosum is short, while the anterior commissure is well developed.

At p. 229 of the same paper, Professor Garrod gives a figure of the upper surface of the brain of a specimen of *Xenurus unicinctus*. This is intermediate in form and surface markings between that of *Dasypus* and the brain of *Tolypeutes*.

The Brain of the Echidna.—In the Atlas accompanying a recent number of Professor Gervais' 'Ostéographie des Monotrèmes vivants et fossiles,' there is given (Pl. VII., fig. 3) a figure of a cast of the interior of the cranium of one of the families of Echidna, *Acanthoglossus Bruijnii*. The convolutions appear to be very numerous and complex, the frontal region, moreover, being especially well developed. Curiously enough, in the only other genus of the Monotremata, namely, *Ornithorhynchus*, the cerebrum is, as described by Meckel in his well-known monograph—"Vix gyris sulcisque excepto in cerebello, notatum." J. C. Galton.

On the White Tracts of the Spinal Cord. By J. M. Preston, M.D. *Dublin Journal of Medical Science*, May and June 1878.—After showing the very scanty amount of information which can be gained by examination of the fully developed cord, as to the origin, course, and destination of the white fibres, a sketch is given of the principal results which have been obtained by Flechsig from a study of the development of the central nervous system.

Seven separate tracts of white matter may be distinguished in the spinal cord by their successive development. These are, in the order of their formation: (1) Fundamental tract of anterior column; (2) Fasciculus cuneatus (Burdach); (3) Anterior mixed tract of lateral column; (4) Lateral bordering layer of grey substance; (5) Goll's column; (6) Direct cerebellar tract; (7) Pyramidal tracts. The first four of these are commissural between different portions of the cord. The number of fibres in each tract varies at each part of the cord according to the amount of grey matter present and to the size of the nerve-roots entering that region. The three last tracts, on the other hand, increase steadily in size from below upwards, and are absent altogether in the most inferior

portions of the cord. Their fibres serve to connect the different regions of the cord with the brain; the pyramidal tracts with the cerebrum and basal ganglia, the cerebellar tracts with the cerebellum, and Goll's column with the medulla oblongata.

Some of the fibres of the pyramidal tracts of each side would appear to arise in the motor regions of the cerebral cortex, others in the basal ganglia. They run in the lower portion of the crus cerebri, and in the anterior pyramid of the same side; they partially decussate at the lower part of the medulla oblongata, and are continued in the cord, partly in the posterior part of the opposite lateral column, partly in the inner part of the anterior column of the same side. Inferiorly they would seem to enter the grey matter and become connected with the large branching cells of the anterior horn. The extent to which the pyramids decussate is very variable. Sometimes the whole pyramid passes to the opposite side; sometimes the greater part remains uncrossed in the anterior column of the same side; and frequently one pyramid decussates to a much greater extent than the other. But this rule is invariable: supposing the anterior pyramids of the medulla oblongata to be of equal size, which is usually the case, the left anterior and right lateral pyramidal tracts are equal to the right anterior and left lateral tracts. This rule proves that the pyramidal tracts grow downwards from the brain, a mode of development which is corroborated by several other circumstances.

The cerebellar tracts arise in the cord from the cells of Clarke's posterior vesicular columns, and pass upwards in the outer and posterior part of the lateral columns, and, without decussating, run in the inferior cerebellar peduncles to the cerebellum of the same side, where their termination is unknown.

The connections of Goll's columns in the cord have not as yet been made out. Superiorly they do not decussate, but terminate in, or at least are interrupted by, the post-pyramidal nuclei of the medulla oblongata.

The facts of secondary degeneration of the cord in cases of disease or injury (whether accidental or experimental) agree in a remarkable degree with those of development.

The vivisections recently performed in Ludwig's laboratory show that the greater number of the fibres which connect far-distant parts of the nervous centres with one another, run in the lateral columns of the cord, and that each half of the cord contains both centrifugal and centripetal fibres from both sides of the body, but that, while the centripetal fibres for the most part decussate in the cord, the

greater number of the centrifugal conductors run a direct course and decussate higher up. The hyperæsthesia which follows certain lesions of the cord depends probably on destruction of inhibitory fibres.

Finally, it is shown that the diseases of the different tracts of white matter in the cord throw but little light on its anatomy or physiology. J. CRICHTON-BROWNE.

Report on Visceral Neurology. By J. MITCHELL BRUCE, M.D., F.R.C.P.—*Innervation of the Heart.*—An exceedingly important point with respect to the inhibiting apparatus of the heart has been demonstrated by Professor Arthur Gamgee and Mr. Priestley (*Journal of Physiology*, i. 39). They have found that the enduring power, or resistance to fatigue by faradaic stimulation, of the inhibiting apparatus that is intermediate between the vagi and the cardiac ganglia, is incomparably higher than the enduring power of the vagi. The intermediate apparatus can be stimulated (standstill induced of the heart) by direct application of the electrodes to the *sinus venosus*, after prolonged faradization of the vagi has ceased to have any effect upon the movements; that is, after complete exhaustion of the vagi-trunks. Another point brought out by the same experiments is that the inhibiting intermediate apparatus in the heart, both of mammals and of the frog, is single, and not double to correspond with the two vagi nerves. Professor Gamgee and Mr. Priestley have shown that M. Tarchanoff's conclusions that the inhibiting apparatus is double in the frog are certainly erroneous.

The question of the situation of the ganglia in the heart of the frog has again been taken up by Professor Bowditch, of Harvard University. He has repeated with various modifications the experiments of himself, Merunowicz, and Bernstein, upon the automatic action of the apex of the ventricle, and has arrived at the conclusion that the apex of the frog's heart does not contain within itself the conditions for automatic motion; and that when, after transverse compression of the ventricle, the apex, at first brought to rest, recommences to beat, this renewal of activity depends upon the restoration of an imperfectly destroyed connection between the apex and the motor apparatus at the base of the heart (*Journal of Physiology*, i. 107).

Depressor Nerve.—Kreidmann believes that he has discovered anatomically the depressor nerve in man and in the dog, where hitherto they have not been found. (*Centralblatt f. med. Wiss.* 1878, No. 11, p. 193.) His description of the nerve that he believes to be the depressor nerve in man is as follows:—The vagus in man forms within its sheath no united whole, but is composed of several

branches. From the *inner* branch there springs the superior laryngeal nerve; this gives off a nerve downwards, which is sometimes thicker, sometimes finer, and derives in its course a twig of variable thickness from the vagus. After an independent course of 2–3 centimètres, it blends with the *inner* branch of the vagus. This nerve, therefore, closely resembles anatomically the depressor nerve of animals, excepting that it does not pursue an independent course in the neck, but lies in the sheath of the vagus.

Innervation of the Blood-vessels.—Vasor centres, and vaso-motor and vaso-dilator nerves, are the subject of many important contributions to physiology and pathology during the last few months. The question of peripheral vasor centres, independent so far of the centres in the cord and brain, has especially received attention. Thus Professor Stricker tries to explain the return of tonus in vessels of the lower extremities that have been dilated by section of the cord by "collateral innervation." He believes that vasor fibres leave the cord at a level above the section, and reach the sciatic nerves through the trunk of the sympathetic. Fresh section of the cord above this level will produce fresh paralysis of the vessels; and section of the sciatics will be followed by the same effect. (*Centralblatt f. med. Wiss.* 1878, No. 3, p. 51.) Gergens and Werber describe the results of experiments which are in favour of the existence of peripheral vasor nerve-mechanisms. The œdema and loss of vascular tone in a pithed frog are found to become decidedly less after twenty-four hours, if the animal be kept in a horizontal position—the heart is again filled, and there is partial recovery of vascular tone. Independent vascular contraction and dilatation can also be seen in pithed frogs, on the application of cold or of chemical stimulants. (*Centralblatt f. med. Wiss.* 1878, No. 6, p. 111.) All attempts to discover a nervous mechanism in the vessel-walls have, however, been unsuccessful. Frey (*Centralblatt f. med. Wiss.* 1878, No. 11, p. 198) supposes that the vaso-constrictor and the vaso-depressor nerves end together in ganglion-cells which lie in the vessel-wall, and that they stand to each other in a simply antagonistic relation. He believes that he has proved this by the results obtained from the simultaneous galvanization of the chorda tympani and sympathetic nerves of the submaxillary gland, while the quantity of blood flowing from one of the larger veins of the gland was carefully measured.

The *accommodation* of the blood-vessels to the quantity of blood within them has long been referred to a nervous mechanism. It is a familiar fact that the general blood-pressure may suffer

little from local vascular disturbance, whether of the nature of contraction or of dilatation; that the intra-vascular injection of blood does not markedly raise the blood-pressure if the vaso-motor centre be intact; and that venesection does not permanently reduce the pressure until as much as 3 per cent. of the body-weight in blood has been removed from the circulation. Pawlow of St. Petersburg has lately made certain investigations to demonstrate the mechanism of this accommodation (*Pflüger's Archiv*, xvi. 4 and 5, p. 266, January 1878). He caused the abdominal veins of a rabbit to become dilated by exposing a loop of intestine, and he then watched the vessels of the ear. These vessels were found to contract. If the cervical sympathetic of one side were previously cut and the same experiment performed, the auricular vessels were seen to contract upon the intact side only—an observation which proves that paralysis of the vaso-motor nerves of the part interfered with the vascular accommodation. The mechanism of accommodation was therefore nervous. We may conclude that just as irritation of the skin causes paralysis of the cutaneous vessels and contraction of visceral vessels, so irritation and dilatation of the visceral vessels lead to contraction of the vessels in other parts of the system; and that it is by this means that the vascular system is accommodated to local alterations on pressure. Accommodation to changes in the amount of blood in the whole circulation must similarly have a nervous mechanism. The physiology of the vaso-motor nerves of striated muscles, and the wider question of the effect of the stimulation of sensory nerves upon the vessels of the same and of other parts of the body, as well as upon the general blood-pressure, are the subject of several important papers by Heidenhain and his pupils, and by Mr. Gaskell (*Pflüger's Archiv*, Bd. 16, p. 1, and *Journal of Physiology*, i. p. 108). The results arrived at are still too uncertain to require notice from us.

The Nervous Mechanism of Respiration.—It has long been a matter of dispute whether amongst the many and complex functions of the vagus in respiration, the innervation of the bronchial muscles should be included. Gerlach (*Centralblatt f. med. Wiss.* 1878, No. 6, p. 105) has investigated the subject experimentally. By attaching a manometer to the trachea close above the bifurcation, he found that faradization of the peripheral end of the vagus in the neck caused a rise of pressure, which was proved by the careful elimination of other causes to be due to contraction of the muscles of the smallest and middle-sized bronchi. Similar results were obtained reflexly, when one vagus was left entire and faradization applied

to the central end of the opposite vagus, or to the central end of the superior laryngeal, but not by irritation of the central end of the recurrent laryngeal. Gerlach has reason to believe that the innervation of the bronchial muscles is not direct from the vagus, but effected through ganglia, as in the stomach and intestine; and that peristaltic movements may occur in the finer bronchia. Zuczek furnishes a very interesting clinical confirmation of the correctness of this view (*Centralblatt f. med. Wiss.* 1878, No. 14, p. 256) in a case where a bronchial gland was diagnosed to be pressing upon the vagus in the chest. A man suffering from chronic apical pneumonia was seized with palpitation of the heart, faintness, and a sense of oppression, the pulse rising to more than 200. Soon after the diaphragm ceased to contract, while the upper ribs acted vigorously, and the area of pulmonary resonance was markedly increased. The heart and lungs rather suddenly returned to their normal state after a period of twenty four hours. As no other possible cause could be discovered, Zuczek concludes that the pulmonary branches in the vagus were irritated, while the cardiac branches were probably paralysed, by an enlarged bronchial gland.

Neurology of the Sympathetic.—A series of cases in which phenomena connected with the sympathetic in the neck were observed by Seeligmüller (*Centralblatt f. med. Wiss.* 1878, No. 1, p. 12), suggests the belief that similar results might be more frequently obtained clinically if they were more carefully searched for. Thus in a child whose left brachial plexus had been paralysed *inter partum*, Seeligmüller found that the left pupil was but half the size of the right; that the corresponding palpebral fissure was small; and that eruptions occupied the left half of the body only. Somewhat similar results followed a gunshot wound in a man through the apex of the left lung; while in a third and in a fourth case signs of irritation of the left cervical sympathetic were observed after injury to the brachial plexus. Seeligmüller is convinced, indeed, that many affections of the apices of the lungs, and even of inflammation of the deeper parts of the lungs, may excite phenomena connected with the sympathetic in the neck.

The circulation within the skull can, according to Fischer (*Centralblatt f. med. Wiss.* 1878, No. 7, p. 124) be influenced by "galvanization of the neck." He will not call the method "galvanization of the sympathetic," believing, as he does, that the ends of the sensory nerves and the different fibres of the vagus are irritated, the latter most powerfully affecting the brain, while the sympathetic contributes but little to the result.

"*Trophic Nerves.*"—Two cases illustrative of the relation between the nutrition of the viscera and muscles and the condition of the central nervous system deserve to be noticed. The first case is published by Kirnberger (*Centralblatt f. med. Wiss.* 1878, No. 3, p. 61). A man of fifty-one fell on the back of his head, and made an impression as large as half-a-crown upon the right occipital and parietal bones. He remained unconscious for twenty-four hours, after which time he presented loss of sight and smell, paresis of the left extremities, and a normal condition of urine. Recovery was slow, but complete. Two years and a half afterwards, however, visceral symptoms made their appearance—the heart became enlarged with a systolic murmur at the left apex, the liver increased in size, the urine was abundant, and contained about ½ per cent. of sugar, an increasing amount of albumen, and casts; there was frequent intestinal hæmorrhage; and nutrition generally was impaired. *Post mortem* a fissure was found to extend downwards and to the left from the seat of injury, with spots of caries; there was chronic pachymeningitis; and several old apoplectic foci were discovered throughout the brain, namely, one in the right posterior lobe, a smaller in the left posterior lobe, a third at the base of the middle lobe near the Sylvian fissure, and a fourth and a fifth on the anterior frontal lobes corresponding to the olfactory bulbs. The heart was large and fatty, the liver was firm, the pancreas was slightly fatty, as were also the kidneys, and the mucous membrane of the intestines was sound.

The second case was one of softening of the cord three years after injury to the left shoulder and loins, which had left permanent uselessness of the left arm. *Post mortem* the dura mater was found firmly adherent to the vertebræ from the third to the tenth dorsal. At the cervical enlargement there was extensive softening of the nature of acute myelitis, both grey and white matter being involved. Exquisite interstitial myositis was found in the muscles of the left arm, while the muscles of the lower extremities were simply atrophied (Leyden, *Centralblatt f. med. Wiss.* 1878, No. 16, p. 295).

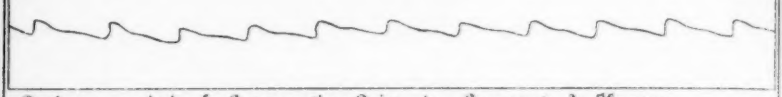
Buzzard on Blepharospasm.—Dr. Buzzard (*Practitioner*, June 1878) succinctly narrates a case of left-sided blepharospasm, of two months' duration, the course of which was not apparent until special investigation was made for pressure-points. The patient was a healthy man, of 53 years of age. One evening, about two months before Dr. Buzzard saw him, the patient suddenly felt a twitching in the left eyelids, which was accompanied by what he called a "numbing feel" about the left temple and ear. The next morning, as soon as he began to eat his break-

fast, he got repeated spasmodic closure of his left eye, accompanied by a sensation of dragging in the neighbourhood. Whenever he began to talk or to eat, or if he got excited, there came a rapid succession of forcible closures of his eye for a few seconds. Dr. Buzzard found that when firm pressure was made upon the tragus and also on the skin for about an inch in front of it, the spasm ceased, but recurred on removal of the pressure, and was apparently more violent. The patient could hear Galton's whistle 8° with his right ear, but only 5° with the left; there was an abnormal sensation in the left ear—not "singing." A large quantity of wax was removed from the left ear by syringing; but this did not appreciably diminish the spasm. A daily application of the constant current for ten minutes—one rheophore being placed in front of the tragus and the other behind the outer canthus—and a blister behind the ear, removed the spasm in a few days, leaving only a trifling flickering of the lids like that called live blood. We learn that there has been no relapse two months since treatment was given up.

Dr. Buzzard remarks that we largely owe to Von Graefe the indications to be derived from "pressure-points," and gives illustrations of the value of the test. Amongst them was a hospital patient with obstinate blepharospasm, in whom Mr. Brudenell Carter, to whom he sent her, divided both subcutaneous malæ nerves, finding that pressure on the cheekbones temporarily checked the spasm. This was done, with instant relief, two years ago, and the patient remains almost free from spasm. In other instances the seat of irritation (as indicated by the effect of pressure) has been an ulcer of the palate, an adherent scar, a decayed tooth, or a branch of the fifth inflamed by cold. Dr. Buzzard suggests that in facial spasm, the source of irritation, which is often unfelt, may sometimes be also distant. He refers to a case of rhythmic movements of the shoulder which he could control by strong pressure in the left ovarian region, and there alone. In the present case he thinks that the auriculo-temporal division of the fifth was irritated (through the twigs which it sends to the meatus auditorius) by the hard mass of wax. Through its branches to the temporo-maxillary articulation, movements of the jaw in eating or talking caused an excitement, which, being propagated to a reflex centre in the medulla or (possibly) in the otic ganglion, occasioned spasm of certain muscles supplied by the portio dura, with which nerve the auriculo-temporal is in intimate relation.

J. Hughlings-Jackson.

Type 1.



During a period of Comparative Quietude. Buoyant & Happy.
27th March. 77.

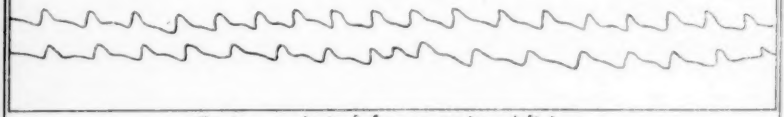
Type 1.

During period of quiet, succeeding period of acute delerium of several days duration. Very sleepy. 14th Novr 77.

Type 1.

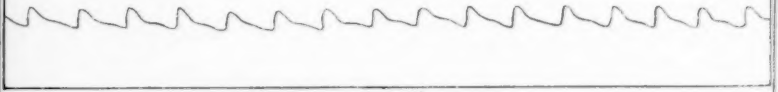
Quiet succeeding acute delirious excitement.
14th Novr 77.

Type 2.



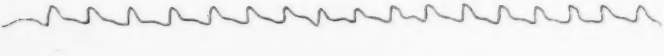
During period of low muttering delirium.
12th Novr 77.

Type 2.



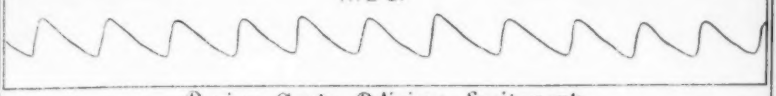
During excited Paroxysm.
15th Octr 77.

Type 2.



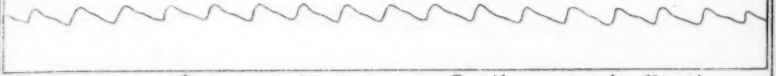
During excited Paroxysm.
15th Octr 77.

Type 3.



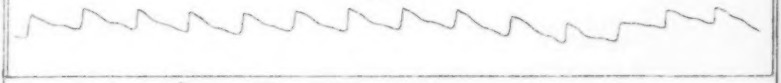
During Acute Delirious Excitement.
4th Decr 77.

Type 3.



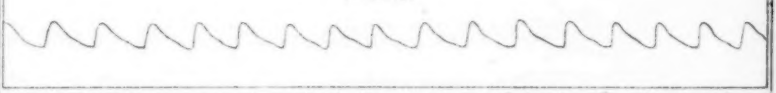
During Acute Delirious Excitement; Pupils unequal, Medium dilatation, Left slightly the larger. 30th Octr 77

Type 3.



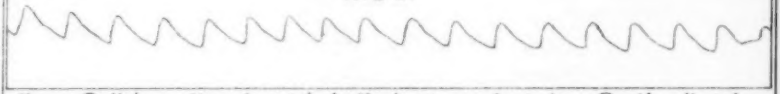
During Somnolence of Congestive attack.
20th Novr 77.

Type 3.



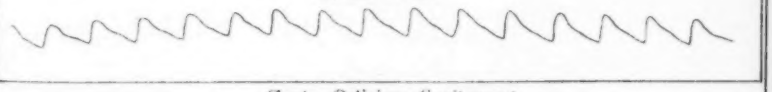
Acute Delirious Attack. with hallucinations of sight. Pupils slightly contracted, the left being the larger. 10th Novr 77.

Type 3.



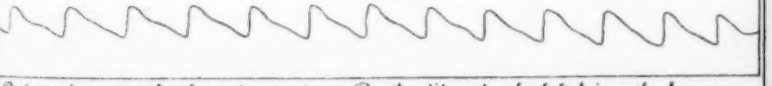
Acute Delirious Attack. with hallucinations of sight, Pupils slightly contracted, the left being the larger. 19th Novr 77.

Mixed Type.



Acute Delirious Excitement.
30th Octr 77.

Mixed Type.



Quiet after attack of excitement:– Pupils dilated, the left being the larger.
22nd Octr 77.